The Chemical Age

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Notes and Comments

Management for Industry

DURING the period of the industrial crisis there was a frantic search for causes, coupled frequently with the adoption by individual concerns of measures that were intended to meet the situation. The wide divergencies of opinion upon measures and causation were evidence of helplessness. The world could be compared with a works wherein an unprecedented failure of plant or process had occurred, and wherein, as is usual upon such occasions, many divergent and irreconcilable views failed to discover the truth until all had been thoroughly investigated. In the same way, now that we are moving away from the stagnation period of the depression, it is becoming possible to see wherein we have failed, and to recognise what must be done in the future. Possibly we are still too close to events to be sure that our judgment is balanced, but the opinions of those presumably qualified to judge are worth attention. Taking the more parochial view which must affect every concern, whatever may be the future policy of industry as a whole, there is the opinion of Sir George Beharrell, past-president of the Federation of British Industries.

He points out that the most important lesson which industrialists have learnt during the crisis is that the problem of the times is not merely financial but is also a problem of production; the problem is thus one of internal management. The purpose of industry, and therefore the purpose of management, is to secure successful trading; management is, therefore, the logical control of all the factors affecting production and distribution. Put in that simple manner, there seems to be nothing that we have not known for years. The management controls the purchase of raw materials; it watches those materials through the works, whilst they are being converted into marketable products; it then sells and delivers the manufactured goods.

A Mistake that Led to the Slump

At one time the "manager" or the owner of the business did all these things; but in those years the structure of business was much more simple. Ultimately a works manager had to be appointed to control production, largely because the skill necessary to control the increasingly complex processes demanded specialisation. Still more recently, the advent of the sales manager has shown that the technical and scientific work is not the only part of the firm wherein the march of progress has entailed specialisation. The problem was still reasonably simple. One department bought in the best markets and manufactured the best products possible with the resources which were available, whilst the other department sold what was made; if the sales department found the markets slack, the manufacturing department eased off production. This simple business structure is to be seen to-day in the carbonising industries, and in many purely chemical firms. In the opinion of Sir George Beharrell, however, it would appear that the persistence of this "hand-to-mouth" type of management is one of the mistakes that led to the slump. Management, in the third decade of the twentieth century, goes far beyond that. How much farther it goes may be visualised graphically from the enumeration of Sir George Beharrell's list of "the wide range of specialists whose help and counsel are available to the modern business man"; they include secretary, accountant, sales manager, advertising manager, transport manager, works manager, engineer (of many types such as electrical, mechanical, safety, production, etc.), chemist, physicist, statistician, economist, purchasing officer, liaison officers, planning departments, and industrial psychologists.

The "Well-Managed" Concern

Why are these specialists necessary in industry? Their worth is said to lie in the fact that "they are trained to assess and measure accurately the value of some specific thing. Taking only two of them, we do not agree that the works manager or the research chemist are valuable solely for this reason, but we may agree that part of their value arises from this cause. The essential point that Sir George Beharrell wishes to make, and in which we must agree with him, is that management to-day has ceased to become opportunist or speculative. In a "well-managed" concern it is possible to analyse events and possibilities so that decisions of the American "hunch" type rarely become necessary, and are usually to be deprecated. The internationalisation of business has been no small factor in bringing this about; decisions can only be made on knowledge, and knowledge is the province of the expert. The management, therefore, must be able to call upon the services of whatever experts are necessary in the conduct of business, and must be able to use the advice given to them to direct the policy of the concern with a vision which sees as far ahead. This raises

another problem of some magnitude, upon which business magnates are conveniently silent. In the past many businesses have been handed down from father to son; directorships have been known to depend upon the cash value of the shares which were held rather than upon merit. We have no hesitation in affirming that without influence or money it is a matter of extreme difficulty to attain a seat on the board of the majority of companies. This must be altered. The management demands, in each of its experts, a high degree of training and technical skill; it is not logical that the staff and shareholders should require a similarly complete training in those who are entrusted with the task of making decisions upon the facts put before them?

What then should be the training of the higher management of business? That is a matter upon which the views of our readers would be welcome. The International Scientific Management Congress is to hold its meeting in England in July next. It is the first time the Congress has been held in this country, and we suggest that the qualifications of the higher management might well occupy the major part of the proceedings.

Our Ultimate Industrial Salvation

If these considerations are of importance in every individual firm, how much more are they of importance under the new conditions which many believe to be our ultimate industrial salvation. The day of the small individualistic firm appears to be numbered. The vast strides made in output, so greatly out-distancing purchasing capacity, have resulted in problems which are measured in terms of industries rather than of companies. The individual concern, unless it has a monopoly, cannot deal effectively with these new problems of redundant plant, hours and conditions of work, research, marketing and bulk purchase. Trade associations are now in being in many industries, but these have a limited scope and we are faced with the multiplicity of organisations. There are many who believe that the powers of these bodies should be merged in a single new type of organisation covering all firms large and small in each industry concerned. In the words of one industrialist, "We need the substitution of an 'industry' psychology for a 'firm' psychology." Rivalry between constituent firms when demand is less than capacity results in small or even negative profits. The process is taking place before our eyes in the steel industry. With the multiplicity of products, it may perhaps be simpler for the chemical industry to reorganise itself in this way than for others, since certain firms could have the manufacture of certain chemicals allocated to them. The whole question is fraught with difficulties, because superimposed upon the natural desire of shareholders to maintain their dividends and to avoid writing down capital, there is the very natural desire on the part of the individuals concerned in the reorganisation to retain their positions and salaries. With so much vested interest at stake, it is hardly to be wondered that slow progress is made. Is it not also a problem of management?

Never before the present day was the industrial world in such need of leadership that possesses good vision, and never was there a greater need for experts upon the board of management.

Depressed Areas

AN important series of articles in "The Times" has called attention to the plight of areas such as Durham which are not and cannot be affected by the revival in trade. Considerable hardship must always occur when a once populous district becomes derelict. This has happened often in the remote past, but as the general level of prosperity was sufficiently high in other parts of the country to enable the situation to be met automatically by migration of the local inhabitants. To-day the situation is too difficult to be amenable to such measures. With the increase in the importance of individual firms, responsibility becomes greater. The industrialist in control of the one great industry in a locality incurs, whether he perceive it or not, a supreme social responsibility to the community which no one else can discharge if he fails. He holds in his hand the ultimate happiness of a thousand homes. If for any reason it becomes necessary to remove the industry from that locality or to abandon it, or to replace men by machinery, the effect is serious in the extreme, unless other means of employment can be found either on the spot or in other parts of the country.

It is of interest to note that attempts are being made to revive the old industries of Cornwall. Just over a hundred years ago when the Peninsular War drove the price of copper up to £140 or £150 a ton, there were more than 400 mines working copper in Cornwall, but tin was neglected. Later on, when there was still strong demand for copper and comparatively little for tin, most of the lodes changed from copper to tin and a large number of mines closed down. These mines have worked intermittently according to the market price of tin, and it is suggested that they could now re-open. In other parts of the country it is proposed to bore for oil. These developments suggest that some new industries can conveniently be started by a thorough survey of the resources of the country in the light of modern methods of working. In the subsequent developments we may expect the chemical industry to take a prominent part. We have heard, for example, that most of the arsenic now being imported could be obtained from the Cornish mines.

United States Chemical Situation

SALES of practically all the principal chemical products exported by the United States to Germany have been greatly stimulated by the depreciation of the dollar. The trade gains have been practically entirely confined to materials not produced at all, or insufficiently by Germany itself, and for which it is therefore dependent upon foreign sources for all or part of its requirements, so that the gains in most cases have represented a shifting in foreign sources of supply. In other cases however, where the United States already enjoyed a virtual monopoly of German imports, the gains doubtless were an expression of German consumers' desires to avail themselves to the greatest extent possible of the lower prices when converted into terms of reichmarks. Part of the gains may also be attributed to a stimulation of German industrial activity. The import movement of American chemicals became particularly strong in the more advanced stages of dollar depreciation, and for most chemicals it reached a peak in September and October last.

The Unification of the Chemical Profession

Professor G. T. Morgan's Presidential Address to the Chemical Society

THE proposals for co-operation between societies and institutions meeting the needs of chemistry—academic and industrial—and the question of a possible larger organisation formed the subject of Professor G. T. Morgan's presidential address to the Chemical Society at its annual meeting which was held at Birmingham University, on Thursday, March 22, when there was a representative attendance of chemists from all parts of the country.

The last four presidential addresses to the Chemical Society, said Professor Morgan, dealt either directly or indirectly with the matter of a closer collaboration between societies and institutions. In 1930, Professor Thorpe referred to the need for uniformity of effort and expounded a scheme in which the Chemical Society, the Society of Chemical Industry, the Institution of Chemical Engineers and the Institution of the Rubber Industry were asked to collaborate with some seven mining and metallurgical institutions, the idea being to house these bodies in one building of which about two-fifths would be assigned for the purposes of the chemical group, thus realising the long cherished ideal of a "Chemistry House." Professor Henderson's first address in 1932 was entitled "The Publication of Chemical Literature," the chief work for which the Chemical Society exists. He referred to the heavy financial burden carried by the Chemical Society and the Society of Chemical Industry, "which perform the valuable national work of publishing the chemical knowledge on which the progress of chemistry and its application to industry depend." In his second address, Professor Henderson mentioned that it had been his intention to refer to the case for amalgamation or federation, but was precluded from doing so owing to the circumstance that a Committee of the Federal Council for Chemistry had been appointed to frame a scheme for achieving this object.

Professor G. T. Morgan, F.R.S.

The matter was recently brought to a head, continued Professor Morgan, by his own presidential address to the Society of Chemical Industry in 1932, entitled "Ourselves and Kindred Societies." On that occasion he discussed present-day conditions of chemical associations as illustrated by a survey of the activities of some fourteen chemical institutions, with further remarks concerning co-operation in publication, prospects of reunion and other cognate topics. The subject matter of this address was referred forthwith to ten local sections and three subject groups of the Society of Chemical Industry, and twelve of these reported in favour of an investigation into the problem of unification, one only being doubtful of the desirability of this step. The most concrete suggestion came from the Birmingham Section in support of a proposal for the formation of a "British Chemical Society" in which all the present scientific and technical organisations should be subsidiary divisions thereby submerging their individuality.

Another immediate effect of this address was the formation of a Committee of the Federal Council consisting of seven representative chemists, under the chairmanship of Sir William Pope, with Mr. Emile Mond as honorary secretary. This committee got to work in November, 1932, and ultimately drafted a report which was then confidential to the Federal Council, and was in turn transmitted to the Councils of the three chartered chemical associations, namely, the Chemical Society, the Institute of Chemistry and the Society of Chemical Industry. Briefly, it called attention to the inconvenience and disadvantage of a multiplicity of scientific, technical and professional bodies dealing with the affairs of chemists and in order to remove such disabilities and to provide a basis for the unification and consolidation of the chemical profession it recommended the formation of a new Society of Chemistry having objects comparable with those of the various Royal Societies concerned with other specific sciences.

The Councils of the Chemical Society and Society of Chemical Industry approved of this scheme in principle and appointed representatives with authority to publish the draft as finally agreed upon by an enlarged committee. The Institute of Chemistry replied to the effect that its Council could not, at the moment, express general approval of the scheme and had appointed a special committee to consider alternative means of ensuring co-operation between the societies concerned. The Council of the Institute felt that at this stage the formation of a new society was unnecessary. It regretted that it was unable to approve—even in general principle—of the scheme suggested by the Committee of the Federal Council, but was prepared to appoint representatives to confer with the Committee of the Federal Council in order to discuss means of promoting co-operation between the three bodies concerned. This invitation was accepted and a Committee of Exploration was duly constituted and met to prepare a draft scheme.

The prevailing idea is now that while each of the three chartered bodies should retain its autonomy they should join in the formation of a Chemical Council constituted under a Deed of Trust to consist of 12 members, three nominated by the Chemical Society, three by the Institute of Chemistry, three by the Society of Chemical Industry and three by "Industry." The principal object of this Council would be the collection and allocation of funds contributed by the constituent bodies and received from outside sources for the support of publication and of a chemical library. This co-operation of the three chartered bodies, however, would represent only a very short step in advance of present conditions, and it is questionable whether this amount of collaboration would meet the criticism of those leaders of industry who complain of the multiplicity of scientific, technical and professional associations among chemists.

The library of the Chemical Society, according to Professor Morgan, is now one of the finest collections of chemical books in the world and is a most valuable asset to British chemists and the British chemical industry. From its inception the Society had alone borne the capital expenditure in purchasing the books and the privilege of using the library was undoubtedly an inducement to chemists to join the Society. In recent years, however, the library has been made available on equal terms to members of certain other societies which have contributed towards the cost of maintenance. As a result of this arrangement there has been one less inducement for chemists to join the Chemical Society. Moreover, Fellows have left the Chemical Society but have continued to

use the library as members of one of the seven contributory societies.

A sub-committee on the business control of publications appointed by the Committee of Exploration reported that the annual expenditure of the three chartered bodies in respect of publication exceeds £25,000 (excluding costs on account of administration) of which editorial salaries and assistance (excluding secretarial staffs) amount to about £5,000. By a central control of business arrangements, however, greater efficiency could be achieved and economy effected in production and distribution and eventually in editorial expenses. Another significant item of the sub-committee's report was a reference to the question of a joint publication containing the officital notices of the three societies, together with ephemeral matter of general interest to chemists.

Prospective Membership

Since its foundation 93 years ago the Chemical Society has been a centralised republic of classical type, but with the growth of chemical activities in provincial centres it has been felt increasingly at the London headquarters that some effort should be made to bring the Society more prominently before the notice of chemists living outside the metropolis. The annual general meetings are no longer confined to London and the present Birmingham meeting is the fouth of the provincial series. This alternation between London and the provinces is likely to remain a permanent feature in the annual programmes. In 1932 a further step was taken when local representatives of the Chemical Society were selected for the chief provincial centres for the purpose of promoting the social and scientific activities of the Society outside London.

The total membership of the three chartered bodies is approximately 14,000, but owing to overlap of membership (about 3,000) this number really represents 11,000 individuals. It has been estimated that there are from 5,000 to 10,000 chemists outside the three main bodies, although probably a substantial number of these are members of other chemical associations. The total membership of some twelve chemical associations other than the three chartered bodies amounts to approximately 10,800, but as there is undoubtedly considerable overlap in some cases amounting to more than 50 per cent. this total probably represents only about 5,000 individuals or even somewhat less. For instance, the British Association of Chemists now has a membership of 1,600, of whom about 54 per cent. are also members of the Institute of Chemistry. If, therefore, in addition to the 11,000 members of the three chartered bodies, it would be possible to attract into a more comprehensive organisation 4,000 of the chemists at present outside the chartered societies 15,000 adherents would be secured.

The Annual Subscription

The question which next arises is what would be an adequate fee to pay an institution which could give to each member recognition of professional status, library facilities, opportunities for scientific meetings and the chemical literature he mainly needs. If this fee were assessed at £5 per annum it would be less than the total subscriptions paid nowadays by a chemist belonging to more than two of the separate organisations. This annual fee paid by 15,000 members would ultimately produce a revenue of £75,000, which compares favourably with the £46,700 collected in 1931 as the combined subscriptions of some 15 chemical associations, to which is added the additional revenue of £31,300 derived from investments, sale of publications, advertisements, rents and occasional donations, giving a total joint income of £78,000.

To be on the safe side the new organisation would require an annual income of at least £85,000. Assuming that the dividends and fees of the present societies were still available, these amounted in 1931 to approximately £7,400. To reach the total of £85,000 the revenues from advertisements and sale of publications would therefore need to be about £3,000. But in 1931 advertisements and sale of publications furnished the 15 societies with a revenue of £23,800. It is scarcely to be contemplated that this rationalisation of publishing activities would lead to a loss represented by £20,000.

Accordingly, Professor Morgan feels justified in assuming that "we should be financially better off as a result of this concerted effort at unification," even after taking into account the fact that certain Fellows and members have paid life compositions to one or more of the chartered bodies so that these members cannot be included among those who would pay the full annual subscription. Much that the Chemical Society has done in spreading chemical knowledge among British chemists is undervalued by the rising generation in spite of the fact that, with truly maternal instinct, the Chemical Society has placed her resources and amenities freely at the disposal of the younger societies and institutions, which ought now to manifest some measure of filial gratitude for the privileges so generously extended by the parent body. "The larger organisation which I have in mind," concluded Professor Morgan, "would undertake the publication of all original contributions from British chemists and also of British chemical abstracts. It would distribute these communications in conveniently sectionalised forms according to the requirements of its various groups of members, and provided always that the great majority of British chemists joined this more comprehensive society it would become possible for its publications committee to devise a scheme whereby a member could select a certain set of publications suited to his needs." With 15,000 members, a Society of Chemistry would also be capable financially of undertaking this task of publication over the whole range of chemical subjects, "especially with the aid of a substantial contribution from the industry, which would probably be forthcoming if this consolidation of chemical interests were an accomplished fact."

That "Adverse" Balance Idea

False Thinking Exposed by "The Independent"

"With the Board of Trade returns for the first two months of the year to cheer us, and with evidence on every hand that a trade revival is, in fact, taking place, can we not help along the process by a return to honesty in economic terminology," asks "The Independent," of March 24. Next month "will witness the completion of the first third of the twentieth century, and if for the other two-thirds we would talk of the arithmetic of trade in the truthful manner of the nineteenth century the prospects for the remainder of the twentieth woud brighten perceptibly. January and February of 1934 have witnessed a great increase in what has come to be known as the 'adverse' balance of trade. This word 'adverse' is the utterest nonsense. In the two months we received into our establishment, as a nation, fifty-one millions worth more of goods and merchandise than we sent away, this 'adverse' balance comparing with only thirty-seven millions in 1933.

"If the view prevails that to send commodities away is to get rich and to receive commodities is to become poor, then, of course, we are fifty-one millions poorer as a result of the two months' trading. If, on the other hand, as we believe, it is true that to secure commodities and to possess or consume them is to become wealthier, to raise the standard of living and to improve the position of the people as a whole, then our two months' trade has made us better off. The first third of the twentieth century has been characterised by false thinking on this matter, and people who ought to know better have been guilty of this 'adverse' balance idea. We have been led to believe that the object of living is to work for wages, whereas, of course, we live in the hope of receiving commodities and services and we only work in order that we may acquire a right to them. The better state of things to-day is due to the fact that the total of trade, adding imports and exports together, is very much bigger than it was."

Substantial increases in tin consumption by the leading industrial countries of the world during 1933 are analysed by the Hague Statistical Office of the International Tin Research and Development Council. The United States consumption increased by 23,533 tons to 58,793 tons; United Kingdom by 1,455 tons to 19,964 tons; France by 1,289 tons to 9,965 tons; and Germany by 1,215 tons to 10,227 tons. World tin consumption during 1933 amounted to 127,400 tons, as compared with 99,986 tons during 1932, an increase of 27,400 tons.

Good and Bad Economy in Raising Steam—II.

By J. H. West, M.I.Chem.E.

In the previous part of this article (The Chemical Age, March 24, page 243) we have considered the questions of fuel and water for boiler plant. We now come to the plant itself and its control.

It may be repeated that this article is not concerned with large power plants in which high-pressure high-duty water-tube boilers are used, but only with the average small or medium-sized chemical factory where steam is generated for process purposes only. Let us then take a plant where 10 tons of steam per hour are required, and assume that an average quality small coal is used as the fuel. We will take it that mechanical stokers are used. Hand-firing, to-day, cannot be regarded as an economical proposition. The admission of cold air to the furnace when putting on coal and when cleaning the fires cannot be avoided, and except with highly skilled and very careful firemen, efficiency is bound to be low. Let us assume, moreover, that the coal as fired has the following composition;—

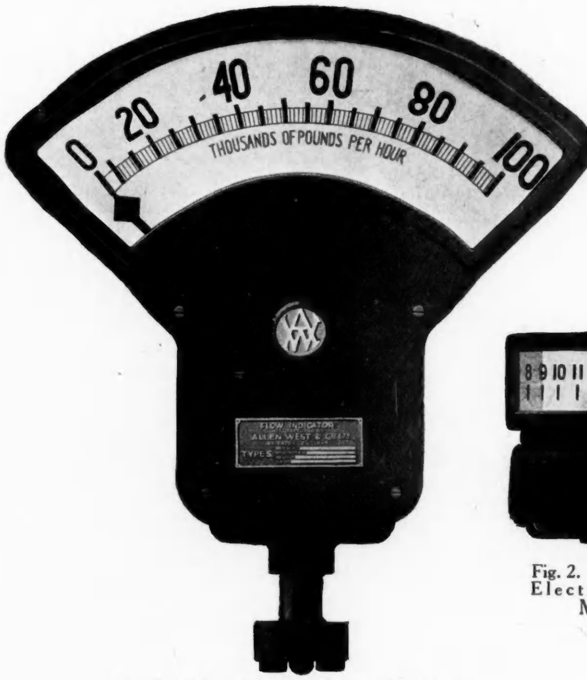

Fig. 1. Bailey Indicating Steam Flow Meter.

Fig. 2. Cambridge Electrical CO_2 Meter

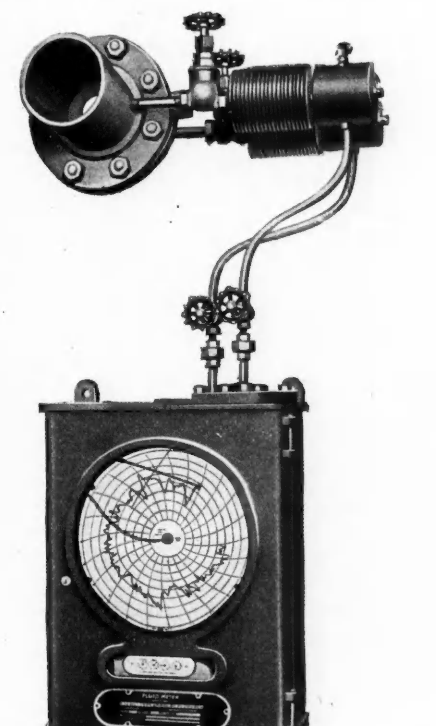

Fig. 3. Bailey Fluid Meter.

	As delivered.		Dry Coal Basis.
Carbon	66.6%	corresponding to C	74%.
Hydrogen	4.5%	,, H_2	5%.
Oxygen	7.2%	,, O_2	8%.
Sulphur	1.8%	,, S	2%.
Ash	9.9%	,, Ash	11%.
Moisture	10.0%	,,	—
	100.0%		100%.

This coal will have a calorific value of 13,325 B.Th.U. per lb. on the dry basis, and 11,992 B.Th.U. per lb. as fired.

An Insufficient Air Supply

We will further assume that steam is generated at 120 lb. gauge pressure, and 70° F. superheat, just enough to keep the steam dry up to the point of use, which is all that is required. The total heat of the slightly superheated steam from 60° F. will then be 1,154 B.Th.U. per lb. It can be calculated that the theoretical quantity of air required for the combustion of 1 lb. of coal as fired, assuming 12.5 per cent. of unburnt carbon in the ash, is 115.7 cu. ft., weighing 8.81 lb. A considerable excess of air over this figure must of necessity be used in order to secure anything like complete combustion. If too little air is used three things may happen—(*a*) the amount of unburnt carbon in the ash will increase; (*b*) CO will be produced as well as CO_2, leading to a heavy loss of efficiency; (*c*) if the boilers are working up to near their full capacity the pressure will drop, i.e., not enough steam will be produced.

Now it is quite possible to get a high percentage of CO_2, the time-honoured criterion of boiler efficiency, by cutting down the air supply, but it may be at the expense of the three items just mentioned. This brings us to the important point that the percentage of CO_2 in the flue gases alone is no real guide to boiler efficiency. To get high efficiency we have to effect a compromise resulting in the lowest attainable total loss from all sources. In other words, we must watch for the presence of CO in the flue gases and unburnt carbon in the ash, as well as for high CO_2. There are other losses, too, which must not be overlooked.

A Heat-Flow Diagram

Fig. 6 shows what becomes of the heat in the coal under reasonably efficient conditions. These conditions have purposely not been taken at a very high level of efficiency, but at one which, if maintained as an average throughout the year, would represent distinctly good working, though fairly easily attainable if a little care is devoted to correct operation. The diagram is a heat-flow diagram, but to give a clearer mental picture of what goes on the values are given in terms of pounds of coal as fired instead of heat units. Thus we start at the bottom with 2,920 lb. of coal put into the furnace.

In the furnace itself we have a loss of the equivalent of 75 lb. in the ash, and of 122 lb. in evaporating water present in the coal or formed by combustion of the hydrogen in the coal, about four-fifths of this loss being due to the latter.

Next we come to the boiler, where 1,827 lb. of coal are usefully expended, but on the other side we lose 235 lb. by radiation and blowdown losses. The superheater recovers 32 lb., and the economiser 292 lb., giving us our 10 tons of steam representing 2,151 lb. of coal.

The efficiency of the boiler alone is nearly 62.6 per cent., and the overall efficiency 72.1 per cent., and the conditions under which these results would be obtained are 39 per cent. of excess aid and 12 per cent. CO_2 in the flue gases, with no CO. To improve the efficiency still further little could be done in the way of reducing the quantity of air without risk of CO being formed, but a large economiser would absorb more than 10 per cent. of the heat in the coal as is here assumed, whilst the allowance for radiation loss, here taken as 8 per cent., is rather generous, and should be improved on with well-built settings in first-class order.

Unburnt Carbon in the Ash

Talking of radiation loss it is far too common to see the lagging on top of Lancashire boilers in a bad state, and one practically never sees the front of one of these boilers lagged, yet this presents quite a large surface at the full temperature of the saturated steam, throwing away heat the whole time.

The question of unburnt carbon in the ash is one that rarely receives the attention that it should. It is, of course, partly a question of correct grate design, but with the best of designs correct operation in the sense of adjusting the travel of the fuel bed in accordance with the amount of steam being generated is essential if a serious loss is to be avoided. Hence we come to the first essential control instrument, quite as important as a CO_2 recorder, namely, a steam flow-meter. This may take the form of a simple indicating instrument (Fig. 1), or the more elaborate chart recorder with integrating gear (Fig. 3). Whichever is used it should be placed where the firemen can see it easily, and there should be one for each boiler. It is extraordinary, when one comes to think of it, that manufacturers should permit their battery of boilers to steam year after year without knowing how they are loaded. If there are four boilers under steam how can one tell without meters whether four are really needed or whether three would not carry the load? Nor is it possible without meters to adjust the rate of travel of the grate or the position of the dampers to the load. When the safety valve begins to blow off it is too late to make adjustments for a falling load. With a meter changes in load can be detected the moment they begin and the control can be varied in advance so that wasteful blowing-off or annoying drops in pressure can be avoided.

There are plenty of reliable flow-meters available. The Bailey meters, which are illustrated, are supplied by Allen West and Co., Ltd. Meters are not very low in price, but they are cheap tools, because they will save their cost many times over in a year when installed on a plant which has hitherto been worked blindfold.

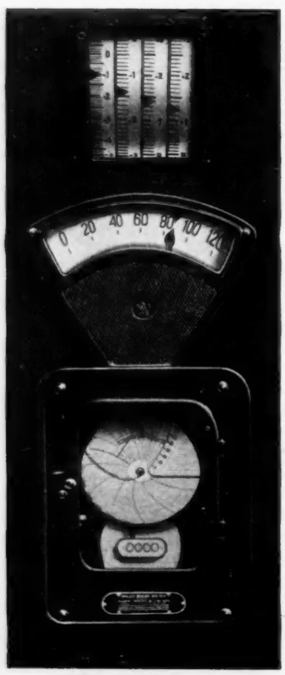

Fig. 4. A Panel of Bailey Instruments.

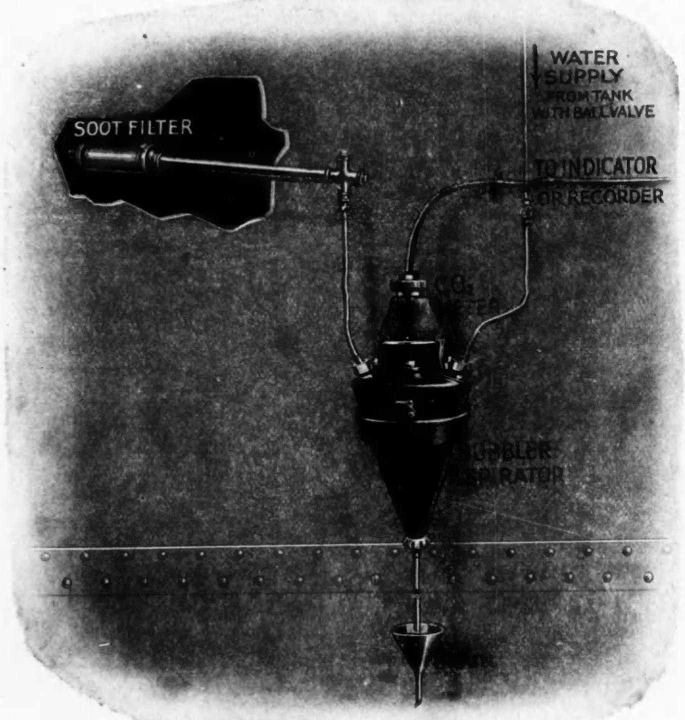

Fig. 5. The CO_2 Pipeline.

Controlling the Air Supply

We now come to the rather vexed question of controlling the air supply. It has already been emphasised that CO_2 percentage alone is not a dependable criterion. To start with, the most economical percentage of CO_2 depends upon the ratio of carbon to hydrogen in the fuel. The more carbon, naturally the more CO_2, and a percentage of CO_2 which would be correct for a highly bituminous coal with a good deal of hydrogen would be too low for coke or coal containing little hydrogen, and far too high for oil fuel with, say, 12 per cent. of hydrogen. Still, if the same, or nearly the same, fuel is always used, and the best percentage of CO_2 has been ascertained, *i.e.*, the highest that can be got without producing an appreciable quantity of CO, the CO_2 indicator or recorder is a very useful guide in controlling the air supply.

The old days of the CO_2 instrument dependent on chemical absorption of the gas are nearly over. Though high in first cost, electrical instruments are, in the writer's opinion, to

be preferred. The working part of the apparatus, where the measurement of the CO_2 or CO is made, can be close to the flue. The gas is filtered inside the flue itself and only clean gas passes through the short tube to the apparatus (Fig. 5), whilst the indicator or recorder can be in its proper place at the boiler front where the fireman can watch it. A modern indicating instrument is shown in Fig. 2; this is a good bold type, but is only made to show one gas, so that to show both CO_2 and CO, as is essential, two instruments are necessary. There are other types which show both gases and have recorders included.

Boiler Meters

The modern tendency is to give up the CO_2 instrument altogether and measure the air supply direct. The reason for this is that it has been found that the quantity of air required for the proper combustion of the fuel necessary to produce a given quantity of steam is independent of the nature of the fuel. All that is necessary, therefore, is to keep the air-steam ratio constant at all loads. This is done by a "boiler-meter" which shows simultaneously the quantity of steam leaving the boiler and the quantity of air going to the furnace.

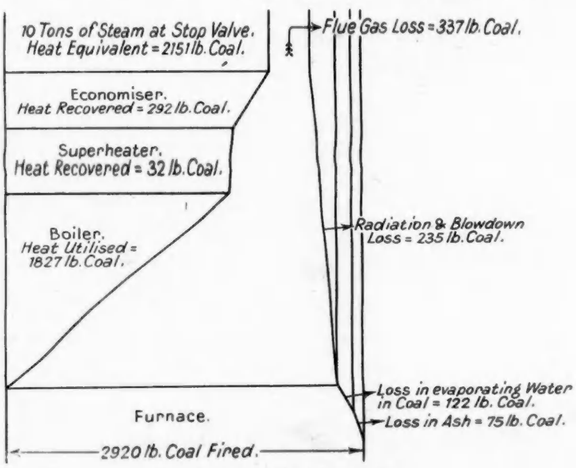

Fig. 6. Heat Distribution Diagram.

Fig. 4 shows a modern panel of instruments for this purpose, again Bailey meters. In the middle is a bold indicating instrument showing steam and air quantities, below is a chart recorder with integrating gear so that total quantities over a period can be ascertained, and above is a multiple draught indicator showing the draught at four points in the path of the gases to the chimney.

The most economical air-steam ratio is found by experiment under the actual working conditions of the plant, and once this is established the pointers or pens are adjusted to give the same readings at this ratio, after which all the firemen or boiler attendants have to do is to work the dampers so as to keep the pointers or pens together at all loads. By watching the indicator or chart coming variations in load can be detected and adjustments of the air made in good time.

It is worth while just to see how much coal is wasted by the use of too much air. Assume that the air supply is increased from 39 per cent. of theory to 80 per cent. of theory. This corresponds to 9.85 per cent. CO_2 in the flue gases, and it would take 105 lb. more coal to heat this extra air to 460° F., the temperature assumed in these calculations for the gases leaving the economiser. If the air supply were increased to 120 per cent. excess over theory, the CO_2 would be just over 8 per cent. and it would take 166 lb. more coal to heat this air. Similarly it can be calculated that with 40 per cent. excess air and 1 per cent. CO in the flue gases, 115 lb. more coal would be required. With larger quantities of excess air the wastage would, of course, be far higher because 1 per cent. CO would represent more carbon incompletely burned. To bring home the way in which waste mounts up it may be pointed out that one extra pound of coal per hour means over three and a half tons of coal per year of 8,000 working hours.

In conclusion, the writer offers three suggestions to chemical manufacturers whose boiler plants are at present burning up their money. First get the plant equipped with proper measuring instruments; secondly, get the control tuned up to a reasonable state of efficiency; thirdly, pay the operating staff a bonus to keep it in that state.

Japanese Chemical Industry

Notable Electrochemical Developments

SINCE 1931 the general chemical industry of Japan has advanced by leaps and bounds and in 1933 it was in such a striking activity as almost hitherto unknown and the sale of every product was exceedingly favourable.

In the field of electrochemistry, states the February issue of the "Journal of the Society of Chemical Industry, Japan," the industrial production of sodium peroxide, ammonium perchlorate, potassium chlorate and various iron alloys was newly commenced. The foundation of magnetism industry was established and the self-support of synthetic acetic acid fulfilled. Many calcium cyanamide factories were restored or erected. The long-cherished desire to manufacture aluminium from domestic raw materials such as alunite or clay, will be attained in the nearest future, a new factory being now under construction. The production capacity of ammonium sulphate will shortly reach the level of a million tons a year. The almost total domestic demand of caustic soda was met by the home production. Its output increased from 44,576 tons in 1931 to 71,327 tons in 1932 and the figures for 1933 and 1934 are expected to reach 100,000 and 187,000 tons respectively. Its imports have been decreasing steadily while exports increased rapidly.

The Rayon Industry

Important developments have been made in the rayon and glass industries. In 1932, 65,000,000 lb. of rayon were produced in Japan, whilst in 1933 this amount was exceeded already by the end of September and the total output in the same year is expected to pass 90,000,000 lb. In a short span of time Japan would become the largest supplier of that commodity in the world. The production of sheet glass has been increasing rapidly, until in 1932 the amount reached 2,800,000 boxes, showing that Japan became the leading producer in the world. The output in 1933 may probably be not less than 3,000,000 boxes. The majority amounts of thick plates and other special kinds of glass are still imported, yet it is expected that in the near future they will be also supplied by the home producers in view of the progress of our technics.

The manufacture and sales of rubber goods were recently put under the good control of the associations and consequently a remarkable advance has been made in this field of industry and the enormous amount of the cheap and superior Japanese goods has been exported.

Cement and Iron

The curtailment rate of the output of portland cement has recently been continuously lowered and the production has been increased steadily. The total output in 1933 was 4,900,000 tons, which is the greatest figure for the last ten years, while in 1932 it was 3,791,000 tons.

The iron industry has also advanced by a long stride. The demand and supply of steel in 1933 were 2,900,000 and 2,750,000 tons respectively, both figures showing new records. The considerable amounts of iron sheets and tin-plate are still imported. Their demand will be wholly met by the home products before long, as new factories are under erection.

THE United Steel Works A.G. is establishing a new plant for sulphur recovery at its coke ovens near Dortmund, one of the largest and most modern establishments of its kind in the Ruhr district. The new plant, which is expected to begin operations in May, 1934, will use the "Thylox" wet purification process, by which the sulphuretted hydrogen contained in the coke-oven gas is first washed out and then converted into refined sulphur. The initial installation will have a capacity for handling 550,000 cu. m. of gas daily, which may be expanded to 990,000 cu. m. at a later date.

Three New Textile Assistants

Means for Avoiding the Formation of Mildew

THE manufacture and finishing of textile assistants now constitutes a special branch of the activities of the Dyestuffs Group of Imperial Chemical Industries, Ltd. Among the latest products which have been placed on the market are Shirlan (an ideal anti-mildew agent), Astol A (an organic solvent emulsion containing trichlorethylene), and Whitcol J (an emulsifying agent).

One of the most serious problems experienced by textile works engaged in the cotton industry is the possibility of mildew formation. This mildew develops upon cotton and upon farinaceous materials which are used as sizes for yarns and as finishes for cotton fabrics. The presence of these sizes is necessary to produce the desired resistance to friction for weaving and also to give the fabric the desired weight, "feel" and "handle." If cotton fabric prepared with these sizes or finishes is kept perfectly dry there is no chance of mildew growth, but for many processes, such as weaving, it is essential to maintain a certain moisture content in the fibres in order to preserve the necessary elasticity of the fibre. This moisture renders the sized warp yarn or the fabric liable to mildew growth and the farinaceous materials used afford an excellent food for mould formation.

The Growth of Mildew

The prevention of the growth of mildew has received considerable attention and a number of products have been suggested for the purpose. One of the simplest products to inhibit this growth is zinc chloride. This material acts as a poison to the mildew culture and, at the same time, owing to its hygroscopic nature, it has a tendency to attract moisture to the fabric, with the result that the weight is increased and the elasticity is enhanced. On the other hand, the use of zinc chloride has very serious disadvantages, the chief one arising from the fact that, unless it is removed from the cloth by washing, the fabric may be tendered during such operations as singeing. On this account it has long been the custom for merchants to stipulate that grey cloth intended for processing shall be guaranteed free from chlorides.

The British Cotton Industry Research Association, after prolonged research, discovered and patented a product, now called Shirlan, which is a far more effective antiseptic than zinc chloride and has none of its objectionable features, and the sole manufacturing and selling rights under the patent are owned by Imperial Chemical Industries, Ltd.

A Powerful Mildew Antiseptic

Shirlan is an odourless and almost white powder, relatively insoluble in cold water, though slightly soluble in boiling water. It is an extremely efficient mildew antiseptic and has no deleterious action upon cloth under any circumstances such as storage, singeing or kier boiling. It is also non-toxic to the human system, and is perfectly stable to atmospheric action. Shirlan, moreover, is approximately thirty times more powerful than zinc chloride, so that sizes in which it is used cost no more than corresponding ones using zinc chloride. The material is marketed in two forms for addition to size mixings, powder and paste, and from the point of view of fungicidal efficiency it can be taken that two parts of the paste equal one part of the powder. Shirlan paste is a product which contains Shirlan in a very highly dispersed physical condition and it has been placed on the market in order to simplify the addition to size mixings and finishes.

In the practical application of Shirlan paste the quality of the antiseptic required to be added to the size mixing is determined by two factors: (*a*) whether protection of the warp from mildew during weaving only is required, and (*b*) whether protection of the woven cloth from mildew during shipment in the grey state is desired. It has been found that 0.06 per cent of the paste (or 0.03 per cent. of powder), calculated upon the total weight of fabric containing sized yarn, is adequate to afford immunity against mildew.

It is a well-known fact that mildew organisms may grow on unsized yarn as well as sized yarn and that cloth mildewed under trade conditions frequently exhibits a mildew growth, not only on the sized warp, but also on the unsized weft. One of the criteria of an efficient anti-mildew agent introduced in warp sizing is that it will distribute itself evenly throughout warp, weft and size in the woven fabric. Shirlan possesses in the fullest degree the capacity for diffusing from warp to weft and thus providing protection of the cloth as a whole. Therefore, where it is desired to protect from mildew attack not only the warp yarn but the woven material, for example during shipment, sufficient Shirlan must be added to the size applied to the warp in the first place to allow of protection of the entire cloth by virtue of the diffusion from warp to weft which takes place. This quantity will be dependent on the composition of the cloth, *i.e.*, if will vary according to the ratio between the proportions by weight of warp and weft in the particular cloth

Application of Shirlan Paste

The requisite quantity of Shirlan paste is added to the starch and water mixture in the cold; which mixture is agitated by the usual mechanical means and the whole is well boiled in the normal manner. If the waste is added to an already boiled size mixture care should be taken to see that the bulk is thoroughly boiled, with agitation, before use.

In addition to Shirlan paste and powder a water-soluble form, Shirlan NA, is also available and is specially recommended as a mildew antiseptic for addition to the water used in conditioning cotton yarn and for use in finishes for dyed and printed goods. In the finishing of dyed and printed goods it has been found that Shirlan NA is an effective fungicide when the goods have to be shipped abroad. It is particularly suitable in the case of such goods as Alizarine Purples, which are liable to mildew attack. It should be added to the usual finishing mixture in such a quantity as to give a concentration of 0.05 per cent on the actual finished fabric. This concentration corresponds to 1 oz. of Shirlan NA for every 120 lb. of finished cloth and this amount will afford the necessary protection against mildew growth.

Emulsified Organic Solvents

Astol A is an organic solvent emulsion containing trichlorethylene. It is well known in the textile trade that trichlorethylene is one of the most valuable of the organic solvents available for the treatment of all types of fabrics. Being insoluble in water it must be applied in the form of an emulsion, and Astol A is a carefully blended emulsion suitable for the treatment of the most delicate materials.

Imperial Chemical Industries, Ltd., have made an extensive study of the application of emulsified organic solvents in various textile processes, and the results of their researches show that two main conditions must be fulfilled before satisfactory results can be obtained. In the first place, the emulsion must be prepared under exact conditions of control giving microscopic globules of the solvent of a definite size. Secondly when the solvent action, as distinct from the dispersing or wetting action, of the emulsion is to be utilised to the full, the material must be used in a reasonable concentrated state. On the other hand, when the dispersing and wetting properties of the organic solvent are in question relatively small quantities may be employed. Astol A fulfils these conditions, and will find its chief application in sucn operations as a scouring agent for woollen and worsted pieces, for de-sizing and scouring artificial silk, and as a spotting agent for the removal of mineral oil stains, etc.

In scouring woollen and worsted pieces Astol A should be added to the normal scouring bath, using about 1 to 4 pints per 10 gallons according to the condition of the material. It will usually be found that in these circumstances the concentration of Lissapol A or other detergent used can be reduced somewhat.

Whitcol J is an emulsifying agent in the form of a clear brown-coloured liquid which readily dissolves in both water and oil. On account of its water solubility it is suitable for

preparing concentrated or mayonnaise types of oil-in-water emulsion and being also oil soluble is suitable as a miscible oil. These miscible oils are not in themselves emulsions but give emulsions on dilution with water.

The preparation of oil-in-water emulsions using Whitcol J is very simple and necessitates no high speed stirring or homogenising plant. Simple paddle or slow speed stirring is all that is required, and Whitcol J therefore offers advantages where elaborate emulsification plant is not available. In the "miscible oil" method of preparing emulsions one part of Whitcol J is mixed with four parts of the oil to be emulsified, this mixture is homogeneous and on pouring with stirring into water an emulsion is produced. The amount of water may be varied to give any desired oil concentration (less than 80 per cent.) in the ultimate emulsion.

The concentrated or "mayonnaise type of emulsion" is cheaper to make compared with the miscible oil method, since the ratio of emulsifying agent to oil is very much less than in the latter method. Ordinary slow speed stirring is all that is required to prepare the emulsion and either hot or cold water may be employed The ultimate emulsions are aslo stable to heating up to about 175° F. (80° C.) and they may be used either hot or cold as is required. For instance, to prepare a 25 per cent. oil-in-water emulsion, 1 part of Whitcol J, 30 parts of mineral oil, and 89 parts of water are required. The Whitcol J is first mixed with $1\frac{1}{2}$ parts of water and the mineral oil is then slowly added with constant stirring. The oil forms immediately an oil-in-water emulsion which becomes thicker as more oil is added. If the consistency of the mixture during the oil addition becomes too great for the power of the stirring plant, water (say 1 to 3 parts) may be added to thin it down a little. When the oil has been added stirring is continued for a few minutes prior to the addition of the remaining water. This diluting water is added slowly at first stirring all the time until the consistency of the emulsion has been thinned considerably. After this point the remainder of water can be added quite rapidly.

Whitcol, it may be added, is a registered trade mark, and is the property of the British Dyestuffs Corporation Ltd. (a subsidiary company of I.C.I.).

Biological Catalysis

Sir Frederick Gowland Hopkins Delivers the Ludwig Mond Lecture

SIR FREDERICK GOWLAND HOPKINS, president of the Royal Society, delivered the Ludwig Mond Lecture at the University of Manchester on March 19, his subject being the new significance of biological catalysis. The Vice-Chancellor, Dr. W. H. Moberly, presided.

The great aid which the application of catalysis afforded to human enterprises, said Sir Frederick, only began to be fully realised about the beginning of the present century. It was noteworthy that almost at the same time came the realisation of the great part that it played in the enterprises of Nature herself, and especially in her greatest enterprise, the production of living organisms and the maintenance of their activities and development. We could not picture the beginnings of life without one form of catalysis or another. Life demanded conditions which were only provided at temperatures which were relatively low, and at such temperatures chemical reactions were slow or altogether in abeyance, and yet life demanded dynamic chemical events in its every manifestation. Therefore we had to picture that even at the earliest stages of life these reactions must be promoted. A catalyst was a substance or a structure which promoted chemical reactions by its presence, though remaining at the end unaltered itself.

Many of the applications of catalysis now so prominent in large-scale industrial processes were realised in the dim past of evolution by organisms which obtained both energy and materials for growth from inorganic nature. The oxidation of ammonia was an example. When we thought of hydrogenation and dehydrogenation—processes now so prominent in industry in which catalysts were used—we should also remember that these processes were equally prominent in the chemical activities of every living cell.

The Recognition of Enzymes

From this point Sir Frederick dealt with the history of the recognition of enzymes—the catalysts without the possession of which every living cell would be a static system. He pointed out that a great number of individual enzymes had now been separated from living cells and tissues of all kinds, and their properties thoroughly studied. He then referred to the theories of enzyme action and pointed out that enzymes were agents which had a specific structure, which was the basis of their activity, but that these structures were associated with what was called a colloid carrier. The active structure of the enzyme was always related to the structure of some molecule, and it was in the union of the two that matter became activated and entered into chemical reactions. In many cases a third substance was necessary for the occurrence of change—a so-called co-enzyme, a relatively simple substance of which many more were now becoming known. There had recently been discovered an enzyme the action of which was essential to respiration in man or the higher animals. Blood pulsed through the tissues to the lungs charged with carbon dioxide, and it had long been known that the mere tension of the gas in the blood was not enough to determine its passage into the lungs with sufficient velocity. But an enzyme was present in the red corpuscles which by its catalytic action enormously increased the velocity with which carbon dioxide lift its combinations in the blood so that the respiratory needs of the body were thus adequately fulfilled.

Perhaps the most important aspect of catalysis by these agencies was the fact that their properties were so specific. Each acted upon only one or, at the most, exceedingly few molecules. An enzyme could not only initiate and accelerate chemical reactions, it could also direct them; and one of the main points which the lecturer suggested was that the high degree of chemical organisation in a living cell depended to a large extent upon the directing powers of the enzymes it contained, since the enzymes secured that the numerous reactions which the cell proceeded in their right relations and with adjusted velocities. This made for the organisation which was so fundamentally the character of the organism.

Synthesis in the Living Cell

Sir Frederick then dealt with the difficulty which had formed the subject of Professor Raper's address at the British Association in 1930. Some of the syntheses in a living cell were so complex that it seemed impossible that they should be due to the control of agencies like enzymes, and as they only occurred in the intact living cell it would seem that they must depend rather on some vital properties of the whole cell and not to agencies which could be isolated from the cell. Certain modern advances seemed to make it clearer how events even so complex as these might be explained by the controlling power of enzymes in the cell.

In closing the lecture, it was pointed out how fundamental were the phenomena of catalysis in the biological field, and, indeed, in the world scheme as a whole. Sir Frederick deprecated attempts to explain or describe the phenomena of life in terms that were too facile. We knew much more about the living cell than was known a generation ago, and that in connection with metabolism that knowledge had been gained by the application of chemical methods and courageous chemical thought to the problems. It would therefore seem that the same path should be followed until it was clear that a region had been reached when chemical considerations no longer applied.

Notes and Reports from the Societies

Institute of Chemistry

Bristol Section : Annual Meeting

THE annual meeting of the Bristol Section of the Institute of Chemistry was held at the Bristol University on March 23. Professor J. F. Thorpe, D.Sc., F.R.S., took the chair and an address on "The Chemistry and Nutritive Value of Grass" was given by Dr. Ernest Vanstone, Seale-Hayne College, Newton Abbot, Devon.

Dr. Vanstone dealt with the statistical aspects of grassland within the British Empire, in which the annual crop of grass is one of the main sources of wealth, and in the United Kingdom alone there are over 22 million acres of grassland compared with 10 million acres of land under the plough. Experiments have been carried out in Northumberland dealing with the influence on cattle growth and quality of meat, by treating the pastures with various types of phosphates. Phosphate treatment of land has also given increased hay crops in Essex and increased milk yields in other areas. Reference was made to the important experiments which have been carried out at Aberystwyth on the chemical composition of grasses and to the Cambridge experiments on the cutting of grass at regular intervals and feeding these crops to sheep, in which it has been shown that young grass possesses the highest feeding value. At Aberdeen the mineral composition of grass has been specially studied, and examples of diseases due to mineral deficiency were shown on the screen. Many pastures are deficient in lime and phosphoric acid, and this leads to malnutrition and malformation of the bones. At the research station of Imperial Chemical Industries, Ltd., the intensive manuring of grass is being studied, as well as the system of rotational grazing.

For the session 1934-35, Professor W. E. Garner was appointed chairman of the Section and Mr. E. Lewis, F.I.C., M.I.Chem.E., was appointed secretary.

Society of Chemical Industry

Exhibition of Air Conditioning Apparatus

THE Yorkshire Section of the Society of Chemical Industry, in conjunction with the Chemical Engineering Group and the Food Group, will hold a Conference on Air Conditioning, and an exhibition of apparatus, at the Queen's Hotel, Leeds, on Friday, April 6. Papers to be read include: "Recent Work in Hygrometry," by Dr. Ezer Griffiths; "Air Conditioning in Industry: a Review of Possible Developments," by Dr. M. C. Marsh; and "The Use of Conditioned Air in Food Manufacture," by Dr. L. H. Lampitt.

The following firms have promised to exhibit apparatus for air conditioning and humidity measurement and control:—Air Conditioning Corpn. (Jeffreys) Ltd.; Andrew Machine Construction Co., Ltd.; Bailey, Grundy & Barrett, Ltd.; James Baldwin & Co., Ltd.; Brecknell Munro & Rogers (1928) Ltd.; Brightside Foundry & Eng. Co., Ltd.,; British Arca Regulators, Ltd.,; Cambridge Instrument Co., Ltd.; Carrier Engineering Co., Ltd.; Casella & Co., Ltd.; Clarke & Vigilant Sprinklers, Ltd.; Elliott Bros. (London), Ltd.; Griffin & Tatlock; Hall & Kay, Ltd.; Mather & Platt; Mathews & Yates; Mellor, Bromley & Co., Ltd.; Negretti & Zambra; Ogden Eng. Co.; Reynolds & Branson, Ltd.; Smethurst Industries, Ltd.; and Textile Air Systems.

Yorkshire Section : Silicosis and Asbestosis

In co-operation with the Refractories Association of Great Britain, the Yorkshire Section of the Society of Chemical Industry will hold a symposium on Friday, April 13, at the Grand Hotel, Sheffield, the subject being "Silicosis and Asbestosis." The papers to be read include "The Morbid Anatomy of Silicosis," by Professor M. J. Stewart, M.B., F.R.C.P.; "The Normal and the Silicotic Lung," by Dr. F. S. Fowweather, M.D., F.I.C.; "Silicosis and the Minerals which cause it," by Dr. W. R. Jones, F.G.S.; and "Some Chemical Aspects of Silicosis," by Dr. F. V. Tideswell.

The Chemical Society

Annual Meeting Held in Birmingham

THE 93rd annual meeting and anniversary dinner of the Chemical Society was held in Birmingham on Thursday, March 22, when Professor G. T. Morgan delivered his presidential address, which is reported elsewhere in this issue of THE CHEMICAL AGE.

The Lord Mayor and Lady Mayoress of Birmingham (Alderman and Mrs. H. E. Goodby) held a reception and dance at the Birmingham Council House on the preceding night. The guests numbered 400, and included, in addition to Fellows of the Chemical Society, representatives of the Birmingham and Midland Sections of the Society of Chemical Industry and the Institute of Chemistry. Among those present were the President of the Chemical Society, Professor G. T. Morgan (director of the Chemical Research Laboratory, Teddington); Professor J. F. Thorpe (President of the Institute of Chemistry and Past-President of the Society); Dr. N. V. Sidgwick (President of the Faraday Society); Sir Charles Grant Robertson (Vice-Chancellor and Principal of Birmingham University); Dr. J. T. Dunn (President of the Society of Chemical Industry); Professor W. N. Haworth (Vice-President of the Chemical Society); Mr. John Evans (President of the Society of Public Analysts); Mr. A. G. Green (President of the Society of Dyers and Colourists); Mr. John Keall (President of the Pharmaceutical Society); Mr. W. Macnab (President of the Institution of Chemical Engineers) and Mr. R. Robison (Chairman of the Executive Committee of the Biochemical Society).

On Thursday morning the Fellows of the Chemical Society and visitors paid visits to the works of Cadbury Brothers, the Dunlop Rubber Co., and Henry Wiggin and Co.; in the afternoon, at the University of Birmingham, they were welcomed on behalf of the University authorities by the Vice-Chancellor and Principal (Sir Charles Grant Robertson) and entertained to tea.

The Anniversary Dinner

The anniversary dinner of the Chemical Society was held at the Grand Hotel, Birmingham, and was largely attended. Professor Morgan presided, and the principal guest was Sir Austen Chamberlain, M.P.

Professor Thorpe proposed "The City of Birmingham," and the Lord Mayor, responding, said that to an ever-increasing extent our industries were becoming more or less dependent on chemistry. The observant visitor to the recent British Industries Fair in Birmingham could not fail to have been impressed by the invaluable aid chemical science was rendering in many phases of modern industry.

In proposing the toast "The Chemical Society," Sir Austen Chamberlain said he was sure that if we were to emerge from our post-war troubles it would be done by new discoveries and new developments of science. The whole tendency of industry to-day was to turn more and more to expert knowledge. The process of development started taking place in the years before the war, when many nations previously dependent upon the products of British factories began to develop a manufacturing industry of their own. It had now become the endeavour and the practice of each nation to supply itself.

Society of Public Analysts.

Forthcoming Papers

A MEETING of the Society of Public Analysts will be held at the Chemical Society's Rooms, Burlington House, London, on Wednesday, April 4, at 8 p.m., when the following papers will be read:—"The Determination of Small Quantities of Fuorides in Water," by Guy Barr, B.A., D.Sc., and A. L. Thorogood, B.Sc.; "A Test for Ethylene Glycol and its Application in the Presence of Glycerol," by A. W. Middleton, B.Sc., A.I.C.; "The Detection of Diamines in Leather," by W. Mather, F.I.C., and W. J. Shanks.

The Industrial Uses of Natural Silica

Quality Controllable by Specification

As generally used the term "quartz" includes sands, sandstone, quartzite, and rock or vein quartz. Flint or chert is a micro-crystalline form, possessing a conchoidal fracture; true chert is usually less pure than true flint, and may be calcareous. Quartzite is a metamorphosed sandstone; it differs from sandstone in that the cementing material is secondary quartz, and the stone therefore has the appearance of being massive quartz. Sandstone, on the other hand, is composed of grains of sand which are cemented together; it differs from quartzite in that when the mass is fractured the fractures go round the grains rather than through them. The common cementing materials are silica, iron oxide, calcium carbonate, and clay. The industrial vaue of a sandstone is fixed largely by the silica content, the strength and character of the cementing medium, and the size of the individual sand grains.

The dividing line between sand and gravel is variously placed at from 0.1 to 0.25 inch. Most sands and gravels consist largely of quartz grains and pebbles, but commercial products usually contain considerable quantities of impurities. For many purposes these impurities are not harmful, but glass sand and moulding sands must conform to very rigid chemical specifications. Diatomite or diatomaceous earth is an amorphous form of silica; it is a light-coloured, lightweight, finely granular and porous aggregate with a texture which is sometimes loosely coherent and sometimes rather compact. Examined under the microscope it is seen to consist almost entirely of the siliceous skeletons of minute water plants, or "diatoms." Tripoli is a white, finely granular, porous form of chalcedonic quartz having the general appearance of diatomite but containing no diatoms. It is generally regarded as a crypto-crystalline variety of quartz, but under low magnification it often appears to be amorphous. In most deposits the rock is soft enough to be crushed in the hand and it is verv easily pulverised by mechanical means.

Metallurgical Fluxing

For use in metallurgical operations, quartz does not need to be of a high chemical purity; vein quartz, quartzite and sandstone all serve the same purpose. Quartz carrying metal, such as copper, gold or silver, is more desirable than barren material, if available. In many cases the material is quarried by the smelting company itself. It must be of fairly uniform size and should not break down at moderate temperatures. In addition, lime, magnesia, and iron content must be low. Siliceous fluxing material is more often used in copper smelting because such ores are generally basic; lead smelting plants consume relatively smaller amounts, and most iron ores already have an excess of silica. Sufficient siliceous matter, however, is often present in the ores which have to be smelted, and therefore obviate the necessity of quarrying barren quartz for this purpose.

Refractories

Fine lumps or crushed quartz and quartzite are employed for the bottoms of reverberatory furnaces and as convertor linings in copper smelting and steel making plant. For copper convertor linings the quartz is crushed to a maximum of about three-eighths to one-half inch, and any fines remain in the product. High-grade vein quartz is the best material to employ, but siliceous material carrying small amounts of gold, silver, or copper is also used, as these metals enter the matte and are recovered. For lining acid Bessemer steel converters chemical purity is very important. Siliceous linings for steel and copper furnace bottoms require quartz of rather high silica content, sand and quartzite being generally used for this purpose. The use of pulverised quartz for refractories is limited to foundry facings and partings and, to a small extent, as an admixture to steel moulding sands. Specifications generally require 65 per cent. to pass a 300-mesh screen, and about 20 per cent. retained on a 200-mesh screen. The material should have a purity of 99 to 99.7 per cent. SiO_2.

The highly refractory nature of silica is also taken advantage of in the manufacture of silica brick, now widely used in metallurgical work. By far the largest part of the silica brick is manufactured from quartzites; loose-grained rock—such as sandstones—have little value for this purpose. In the United States this material is known as "ganister" and differs from quartzite in that it contains a natural bonding material in the form of refractory clay, sometimes as much as 10 per cent. It should contain about 98 per cent. silica and not more than 1½ per cent. alumina, and should crush into angular fragments which pass an 8-mesh screen. When silica brick is made from quartzite lime is generally used as a bonding material, about 2 per cent. being added to the crushed rock in the form of milk of lime. The quartzite and lime are milled in wet pans until a slightly cohesive mass is produced; this is then moulded by hand, dried and re-pressed by machinery. When dry the pressed bricks are kilned, with a finishing temperature of 1,500° C. Such bricks are chiefly used where great heat resistance combined with an absence of shrinkage is essential, as in the arches, crowns, and higher parts of various furnaces and kilns, for certain parts of glass furnaces, and for parts above the floor level in coke-oven construction.

Acid Tower Packing

Acid-proof stoneware and terra-cotta in the shape of cylindrical rings, balls, etc., have replaced quartz to a great extent as a packing in acid towers for the chamber process of making sulphuric acid, because they permit a more efficient arrangement of surface and channels for the counterflow of gas and liquid, but, nevertheless, a certain quantity of quartz is still used. For this purpose the material should look vitreous and must be free of all impurities which are soluble in acids (especially iron and arsenic); it must also be devoid of clay seams which the acid would attack and thereby cause the lumps to crumble. The lumps, moreover, must be of uniform size, as the quartz is placed in successive layers, according to size, with the larger lumps at the bottom of the tower. Size varies according to the actual use to which the tower is put. For some purposes the lumps may range from 1 to 3 inches in diameter; in other towers it may be graded from 1 inch to pea size, or yet, again, it may range from 2 to 8 inches, with an average of 4 inches. In ammonia absorption towers the quartz is often closely graded between 1 to 2 inches in diameter.

Industrial Fillers

Considerable quantities of pulverised quartz are used as fillers. In paste wood fillers the sharp, angular grains block up or bridge over the larger pores in the grain of the wood but do not prevent capillary action of the liquid into the smaller pores. Soft silicas, including tripoli, are used more widely in paints, but quartz is superior to tripoli as a wood filler. The general requirements of quartz for these purposes are chemical purity or freedom from substances which will react with the vehicle, sharpness or angularity, lack of colour, and fine particle size.

Only a relatively small amount of pulverised crystalline quartz is used in rubber compounding, as it is difficult to grind it to the desired fineness. The edges of the individual particles are very sharp and would tend to cut the rubber when stretched; the glassy surface, moreover, does not give good adhesion between the rubber and the mineral. What little is used is added to hard-rubber articles for acid-resisting purposes, as in the manufacture of battery boxes and chemical apparatus, or for its abrasive properties. Fairly large quantities of quartz, however, are used in gypsum plaster preparation, especially wallboard. The properties that make it desirable for this purpose are its refractory nature, whiteness, and chemical inertness; it is also cheap and reduces the expansion of the plaster on setting. Most of the material so used, is ground from quartz sand rather than vein quartz.

In the ceramic industry, quartz (generally referred to as "flint"), is used in the body of whiteware to reduce the drying and firing shrinkage and to give the body a certain rigidity to resist deformation; it also makes the body more porous, promotes quicker drying and permits the escape of steam. It is also used in mixtures for enamelling iron and steel, chiefly as a source of silica to combine with or flux the basic oxides. The chemical requirements are identical for whiteware and enamel. Iron and other metallic oxides are extremely objectionable, although small amounts are usually present. Small quantities of alumina are also present; but as large amounts of alumina from clay and feldspar are always in the finished product, the presence of alumina in the quartz is not objectionable, although potters prefer a closely approaching 100 per cent. purity to assure a uniform mixture.

Quartz as an Abrasive

Quartz abrasives are used to a considerable extent, although in common with other natural abrasives they have suffered from the competition of artificial materials. Segmental pulpstones, constructed of artificial abrasives and attached to a core of concrete or metal, are finding increasing use as substitutes for natural pulpstones. The output of burrstones and millstones is also showing a decrease, as they are being replaced by hammer mills, and by tube and ball mills. This, however, does not hold true for the purpose of pulverising minerals and other substances where contamination by iron must be avoided. Quartz sand and sandstone are employed in buffing compounds, metal polishes, grinding pebbles, grindstones, pulpstones and whetstones, for sand-blasting, for the wire-saw cutting of slate and marble, and for the cutting and grinding of glass. Probably the largest single use as an abrasive is for polishing plate glass. Pulverised quartz is also used as an abrasive in soaps and in scouring and buffing compounds. Some of the pulverised material is air-floated and used in metal polishes; this material completely passes a 300-mesh screen and although extremely fine the angularity of the grains is still evident.

The rapid development of the artificial abrasives silicon carbide and fused aluminium oxide with their superior hardness, sharpness, and tougher grain, and improvements in methods of recovery and preparation of garnet, have now caused these substances to displace quartz as an abrasive, but this has been less pronounced in the manufacture of sandpaper than in other abrasive industries.

Tube Mill Linings

Siliceous linings are used for all types of mills where materials must be kept free from contamination by iron. Such mills include those dealing with ceramic materials, paint pigments, enamels and the best grades of whiting and barytes. Siliceous linings are still used to some extent in ore dressing and metallurgical plant, and quite extensively by the cement industry. Many siliceous linings are made of flint imported from Belgium.

Extremely hard, tough, rounded flint pebbles are used in cylindrical or conical mills for grinding ores, especially where contamination of the product by iron must be prevented. Most of the foreign flint pebbles are obtained from deposits in Greenland and Belgium, and from the sea-coast of France between Havre and St. Valery-sur-Somme. The Greenland stones are sent to Denmark, are known as Danish pebbles, and on account of their great hardness and toughness they are recognised as a standard type of pebble.

(*To be continued.*)

Letters to the Editor

Science and Present-Day Adult Education

SIR,—Recent editorial comments in THE CHEMICAL AGE, and the widely read remarks of Sir Frederick Gowland Hopkins on the value of so-called "popular" science have prompted me to set down the following considerations arrived at after experience in instruction of adults in the principles of scientific thought.

Whatever may be said regarding the progress of science, by laymen or professional, nobody can ignore it; the environment of each individual has become so modified by the various achievements of scientific progress that our physical lives may be regarded as a synthesis arising from the ingenious adaptation of scientific facts. This being so, it is imperative that the ordinary member of the community shall appreciate his position in relation to this environment; that he shall realise that science is the warp of the fabric of knowledge, and more especially that he shall fully understand that the economic turmoil of the present world cannot be calmed and elucidated without the aid of scientific principles. The Adult Education Movement has not ignored this aspect of education; realising that the parents of this generation condition the children of the next, attempts have been made, not unsuccessfully, to make those sections of the community with which it has contacts, "science-conscious," if for a moment one may borrow the jargon of the psychologist.

Such a task is no easy one. It must be laid down as axiomatic that no attempts must be made to render adult education technological; there are adequate means in the continuative education departments for such teaching. The aim of adult education, so far as science is concerned, is not to produce the scientific adept, but to turn the thoughts of the community towards that inevitable march of science, of which each generation is of necessity a spectator; to make each member of the community aware of the part he is playing in the general synthesis of modern scientific conditions. One of the more obvious difficulties which faces the lecturer in adult education is the absence of mathematical knowledge, and of scientific fundamentals in the material he is called upon to teach.

Dealing with that large section of the community which has had only an elementary education or at best "up to matriculation" in a secondary school, the surprising factor soon becomes apparent that in a year of two after leaving school much of the so-called "groundwork" has disappeared. In a great many cases, especially women, the ordinary occupation does not involve the use of mathematical or scientific facts and apart from adding up a few bills, the mathematical sense becomes moribund. It is no uncommon thing to find students in adult education classes to whom the idea of ratio and percentage means little, and it is definitely uncommon to find a student to whom graphical representation means anything at all. Elementary chemistry, physics and biology will be found to have disappeared in the same way.

It is probably this factor that prompted Sir Frederick Gowland Hopkins to ask whether it is of any value that money and time should be expended in teaching to people the more elementary facts of science which can never be of conscious value to them in after-life. But has he gone far enough into the question, and considered why it is that such factors are of no conscious value in after-life? Those of us who believe in adult education in scientific matters hold that true education can only be attained by continued study during the adult period, a certain section of the community can attain this by their own unaided efforts; but the vast majority need guidance.

In various parts of this country adult education in science is initiated by a twenty-four lecture course on "science in everyday life"; discussion is encouraged and no question is considered too trivial, provided that it is prompted by sincerity; and the thinking adult soon comes to realise that he knows but little, either of the material world in which he lives, nor of the marvellous organisms of which he himself is an example. Interest is stimulated, and can be maintained during a second course on biological topics, in which the chemistry of the animal system is discussed in its relation to medicine, to metabolism, to the individual, and to the community and the State. Further work depends on the class; a three-year course in biology has been maintained in various districts with unflagging enthusiasm and the students soon

arrive at a stage when intelligent discussion, supplemented by wide reading, brings a strong cultural aspect to the work. Alternatively, a three-year course on the growth and origins of science may be taken, in which the history of the various sciences and arts is traced out and through which a proper understanding of the present conditions may be built up. All this is sound constructive work, and the writer cannot too strongly stress the broad cultural aspect which this work assumes as it proceeds.

It is this cultural aspect of science that has hitherto been ignored; it being assumed that the technological aspect of science could not be divorced from the cultural. Fortunately, it is just being realised that, just in the same way as an appreciation of music or drama does not necessarily imply executive or creative ability or knowledge, so the intelligent member of the community can build up a sense of scientific appreciation which will lead him to a fuller communal life, and to a realisation of the values of research and investigation; perhaps even to an insistence that governments shall be compelled to utilise discoveries for the general benefit of the community.

Scientific education in the schools should be the preliminary for this further education; biology, chemistry, physics and mathematics form an inextricably interrelated group and should be taught will a full appreciation of this factor, and not as mutually independent subjects. Perhaps the key to much of our present difficulty lies in this; although the chemistry master who is incapable of inculcating anything more than that " H_2O means water " is in the descendent, his type still remains; our first task must be to put our own house in order, and to avoid the silly specialisation that produces such a type. I have met chemists of some distinction who had no ideas at all concerning their own internal organs; who were aware that " the blood went round and round and took in oxygen and gave out CO_2 " and could write the formula (so-called) of hæmaglobin, but who had then exhausted their whole stock of knowledge on the matter. The truth is that chemistry can only be taught successfully to the general student when presented in its correct relation to the exact and biological sciences, and the sooner our science teachers realise this and prepare themselves for it, the better.
—Yours faithfully,

G. MALCOLM DYSON, Ph.D., A.I.C.

Loughborough.

Prospecting for Petroleum in Great Britain

Ownership to be Vested in the State

IN the House of Commons on March 22, Mr. Walter Runciman (President of the Board of Trade) announced that the Government has recently considered the question of taking steps to stimulate the search for oil in Great Britain. Since the programme of oil drilling financed by the Exchequer was carried out during the period 1918-22, there had been no large efforts to find oil in this country. Recently, however, the Government had received indications of renewed interest in the search, and it had decided that it was desirable to review the whole situation. This had been done, and the Government had decided to introduce legislation, the principal object of which was to remove some of the main difficulties that it was claimed stood in the way of research on an extensive scale, and to secure the orderly development of any oil that might be discovered. The Bill would provide that the ownership of all petroleum that might exist, but was at present unknown, should be vested in the State. The rights of owners would be compensated, and disturbance of property in land and amenities would be safeguarded.

Provisions of the New Bill

The new Petroleum (Production) Bill, which was introduced by the Earl of Munster in the House of Lords, on March 22, defines " petroleum " as including any mineral oil or relative hydrocarbon and natural gas existing in its natural condition in strata. It does not include coal or bituminous shales or other stratified deposits from which oil can be extracted by destructive distillation. The Bill provides for the Board of Trade, on behalf of the Crown, to grant licences to search and bore for and get petroleum upon terms and conditions that the Board of Trade thinks fit. The grant of a licence will not confer the right to enter on or interfere with land. The licence holder is to make his own arrangements with owners of land for any necessary facilities, but, where these cannot be obtained by agreement, the granting of facilities to the licence holder will be the subject of consideration by the Court on lines similar to those contained in the Mines (Working Facilities and Support) Act. Provisions are incorporated for the preservation of local amenities, and for the protection of landowners from being charged with the costs of an application. Money received by the Board will be paid into the Exchequer.

The Board of Trade will be empowered to make regulations prescribing the manner in which, and the persons by whom, applications for licences may be made; the fees to be paid on any application; conditions as to the size and shape of areas in respect of which licences may be granted; model clauses which shall, unless the Board thinks fit to modify or exclude them in any particular case, be incorporated in any licence; and different regulations for different kinds of licence.

A schedule attached to the Bill shows that only three licences are in force under the Petroleum (Production) Act, 1918. These were granted to the Duke of Devonshire for boring near Harstoft, Derbyshire; to Mr. Henry King Hiller, for an area near Heathfield, Sussex; and the N.M.D. Syndicate, Ltd., prospecting near Three Bridges, Sussex. This Act of 1918 will subsequently be repealed.

A few weeks before the Armistice in 1918, when the development of all Great Britain's natural resources was of first importance, drilling for oil was inaugurated in this country under the direction of the Mineral Oil Department of the Ministry of Munitions. Pearson and Sons, the late Lord Cowdray's firm, were appointed petroleum development managers under the Department, and they were responsible for the borings at Harstoft, Derbyshire, which have since produced a steady flow of oil. If a straight line were drawn from Sheffield to Nottingham, Harstoft would lie almost precisely halfway along it. The well is more than 3,000 feet deep, and even to-day, after nearly 16 years, the oil rises to the surface under its own pressure. In 1919 the Mineral Oil Department of the Munitions Ministry ceased to exist, and in 1928 the Harstoft wells were taken over by the Duke of Devonshire. In the opinion of many experts considerable oil supplies may be found in the district.

Favourable Oil-Bearing Districts

Petroleum oil—as distinct from oil-shale—has also been found in Yorkshire, Lancashire, Durham, Cumberland, Notts, Shropshire, and South Wales, in addition to Derbyshire and Sussex. A comprehensive report on mineral oils, issued by the Geological Survey of Great Britain some years ago, gives details of all these discoveries, but is not very hopeful about the prospects of commercial developments. " There are many records," the report says, " of occurrences of mineral oil in Great Britain, but the importance attached to them has been out of proportion to the quantity of oil obtained or the permanence of the supply. In the majority of cases the quantity was trivial.

A Yorkshire oil discovery recalled by the report was that at the Manvers Main Colliery, Wath-on-Dearne, in 1902. The oil was found in the roof of a coal seam and it gushed out with such force that it ran down the working and filled those at a lower level. The first day no less than 3,600 gallons were collected; the second day 2,800 gallons, and the third 1,400. Oil was sold regularly until the year 1916, and the " oozes " were still reported in 1918.

Research Association Finance

London Conference Convened by D.S.I.R.

A CONFERENCE convened by the Department of Scientific and Industrial Research, to provide an opportunity for a frank discussion of the present position and future of the research association movement, was held in London on March 22, and was attended by over one hundred representatives of the 21 industrial research associations formed under the auspices of the Department. Lord Rutherford presided, and members of the Department's Advisory Council were present together with officers of the Department.

The views expressed left no doubt that the Advisory Council of the Department were right in believing that the time was ripe for a great development in the research association movement. It was plain that the vital necessity for linking up science and industry was now fully recognised. It was also obvious that there was no doubt as to the importance of co-operative industrial research as carried out by the research associations, both as a means of bringing the benefits of research to the smaller units which form the bulk of British industry and of providing, in the case of those undertakings large enough to maintain their own research establishments, a method for the exchange of experience and discussions of manufacturing difficulties.

It was made clear that the research associations had already made a deep impression on British industry, not only in producing practical results of very great monetary value, but in bringing about a more sympathetic attitude towards the usefulness of scientifically trained men in the works. Great emphasis was laid on the paramount duty of research associations of carrying out the long-range investigations essential to the widening of the boundaries of knowledge and without which progress becomes impossible. General agreement was expressed that the present resources of associations were entirely inadequate and should be largely increased. Several speakers drew attention to the benefit conferred on the consumer by the improvement in products as regards quality and price and to the raising of the standard of living resulting therefrom and for this reason urged that a continuation of a substantial contribution from Government sources was fully justified. Attention was also drawn to the importance of achieving stability of finance for the research associations as a means of securing the best work from the workers employed and of ensuring that the best scientific brains were available for their service, and of making possible the planning of long-distance programmes.

Lord Rutherford referred to the statement made by Mr. Runciman, on behalf of the Lord President of the Council, at a dinner to the representatives and other prominent men in industry and finance given by Sir Kenneth Lee on the eve of the conference, as to the willingness of the Government to afford increased financial help. He urged that, as the next step, the Councils of the individual research associations should consider the scale of work required to meet the needs of their particular industries and submit proposals for the consideration of the Department in order to bring about at the earliest possible date a very different scale of operations.

Explosion at Imperial College of Science

High Pressure Research Laboratory Damaged

Two explosions occurred early Friday morning, March 23, in the high-pressure research laboratory at the Imperial College of Science and Technology, South Kensington. Nobody was injured, but the laboratory was damaged and scientific apparatus was destroyed.

The first explosion occurred about 1.20 a.m., when a cylinder, containing high-pressure gas, blew up, and there was an outbreak of fire with a second explosion almost immediately afterwards. The windows were blown out and smoke and flames poured out of the laboratory, which is a fire-proof room and is protected by heavy steel doors. Students of the college living in the hostel near by, who were awakened by the explosions, hastened to the street but were not allowed near the building, because of the danger of further explosions. While firemen were at work the police scrutinised everybody who approached the building.

The cause of the explosions is unknown. An official of the college stated that the damage was confined to the high-pressure laboratory, the steel-lined walls of which had diminished the force of the explosion. Two small metal cylinders containing gas had burst and the explosion had wrecked some experimental apparatus and bench fittings.

Chemical Matters in Parliament

Manufacture of Phosphates

IN the House of Commons on March 19 Dr. Burgin (Parliamentary Secretary to the Board of Trade) moved approval of the Additional Import Duties (No. 4) Order. It related, he said, to imports of di-sodium phosphate and tri-sodium phosphate, both of which substances were used in the textile and other industries. Continental phosphates had been coming into this country at prices below the British cost of production despite the *ad valorem* duty. Additional plant was available and British firms were increasing their manufacture. The Import Duties Advisory Committee desired to encourage the manufacture in this country of these phosphates to an extent sufficient to supply all the needs of the United Kingdom. Consuming industries were satisfied they could do so with only a negligible increase of cost to the industries concerned.

Replying to questions, Dr. Burgin said all the Order did was to include two chemicals, that had hitherto been 10 per cent., in the general level of 20 per cent. duties.

The Order was approved.

Training in Laboratory Arts

New Scheme Announced by the Institute of Physics

THE need for the proper training and certificating of laboratory and technical assistants in physics has been recognised for some time past. The Institute of Physics has now announced a scheme to meet this demand, and proposes in due course to set up an appointments register and an organisation for these assistants, upon whom the success of many pieces of research has so much depended.

Candidates for the Institute's certificates must attend approved courses of instruction and pass examinations in accordance with the regulations issued. The Institute is prepared to recognise schemes of training for this purpose, conducted under approved conditions, submitted by any teaching centre. It is understood that evening class courses for the Institute's certificates will be commenced in September next in London. The regulations require the courses to be divided into four sections:—(a) Practical mathematics and physics; (b) simple wood and metal work; (c) glass blowing; and (d) laboratory technique and organisation. To qualify for the award of a certificate a candidate, unless otherwise exempted under the regulations, must in addition to fulfilling certain other qualifications have obtained an adequate standard in the first section, and in two of the three remaining sections.

Full particulars and copies of the regulations may be obtained from the Secretary, Institute of Physics, 1 Lowther Gardens, Exhibition Road, London, S.W.7.

THE February issue of "Sands, Clays and Minerals," published by A. L. Curtis, P.O. Box 61, Westmoor Laboratory, Chatteris, is devoted to economic minerals and contains articles on "The Analysis of Zircon Sand" (W. R. Schoeller); "Tungsten and its Uses" (L. Sanderson); "The Decay of Building Stone Through Soot" (A. R. Warner); "Elutriation as an Aid to Fine Grinding" (A. R. Curtis); "Anhydrous Silicates of Aluminium in South Australia" (J. W. Iliffe); "Refractory Cement, Practical Tests On" (W. O. Lake); "Manganese Dioxide for Colouring Bricks" (A. G. Arend); and "Sandstone Blocks for Pickling Baths" (C. Campbell).

News from the Allied Industries

Artificial Silk

IN THE CHANCERY DIVISION on March 22, Mr. Justice Clauson appointed a receiver for Alliance Artificial Silk, Ltd. Mr. N. A. J. Cohen, who applied on behalf of Thompson and Partners, said that the motion stood over from the previous Friday to enable counsel to file further evidence. A further affidavit had been filed and it was stated that 52 per cent. of the holders of the total issue of the series of debentures concerned supported the application for a receiver. Six per cent. of the holders were opposed to the application and 42 per cent. had not replied. Mr. Cohen added that no business was being actually carried on by the company, and he did not ask for a manager.

AT A MEETING HELD IN MANCHESTER on March 26, it was announced by Mr. H. W. Garnett, official liquidator of the Nuera Art Silk Co., Ltd., of Saint Helens, that the assets of the company had been realised and a final payment had been made to creditors, but no return was possible to shareholders, either ordinary or deferred.

Seed Crushing

AN INTERESTING COMMENT on the effect of the import duties on the seed crushing trade was made by Mr. J. W. Pearson, presiding at the ordinary general meeting of the British Oil and Cake Mills, Ltd., held in London on March 26. In the early days of tariffs, said Mr. Pearson, there was no doubt that the imposition of duties was of considerable help to the seed crushing trade, but there followed a complete reorganisation of the tariff and import systems of the other principal European countries. Quantities of materials towards the end of 1933 tended to find their way into the United Kingdom which had previously found markets elsewhere, and the comparatively moderate tariffs of the United Kingdom which were not levied on imports from the Empire were of little avail in affording any effective protection to home manufacturers.

German Chemical Plant

Coal Consumption

THE trend of German chemical production during recent years is revealed in German coal consumption statistics. In 1929 the chemical industry accounted for 12 per cent. of Germany's total industrial coal consumption; its share declined to 11 per cent. in 1930, recovered somewhat (to $11\frac{1}{2}$ per cent.) in 1931, and rose much higher (to 13 per cent.) in 1932. The chemical industry as a coal consumer ranks after (1) iron, steel, and metal-working industries; (2) railroads; (3) electricity generating plants and (4) gasworks. While the chemical industry increased its relative position in total industrial consumption, the volume used showed a sharp decline during the years 1929-1932, as will be seen in the following table:—

Year	Coal.	Coke.	Brown Coal.	Briquets.
		Metric tons.		
1929 ...	2,960,000	1,720,000	11,100,000	1,360,000
1930 ...	2,290,000	1,110,000	7,700,000	1,070,000
1931 .	2,070,000	710,000	6,100,000	890,000
1932 ..	1,830,000	740,000	6,100,000	860,000

German Synthetic Camphor Trade

THE adverse course of Germany's export trade in synthetic camphor in the early months of 1933 subsequently improved in the spring months and throughout the remainder of the year. As a result of improvement, total exports for the entire first 11 months amounted to 1,231 metric tons, compared with 1,268 tons in the first 11 months of 1932. However, losses recorded in 1932 and previous years were not regained, and the 1933 trade remained far below the levels of previous years, comparing with exports of 1,877 tons in 1931, 2,181 tons in 1930, and 3,049 tons in 1929

Continental Chemical Notes

A RAYON INDUSTRY is to be established in Norway, if the necessary capital can be raised.

* * *

INCREASED OUTPUT OF GOLD in Roumania is expected to follow replacement of the existing primitive methods by up-to-date machinery, states "Metallbörse."

* * *

TRI-BROM-BETA-NAPHTHOL dissolved in carbon tetrachloride has been patented as an insecticide (German Patent 579,858). Other preparations for combating plant pests described in recent patents are: Reaction products of piperidine with aliphatic alkyl halides containing at least 8 carbon atoms (German Patent 580,032); solutions in fungicidal or insecticidal oils of substances in which polyglycol ether residues with 4 or more C_2H_4-groups have been introduced (German Patent 583,343).

* * *

CONTRARY TO THE GENERALLY ACCEPTED VIEW that the carbazole isolated from coal tar is formed by pyrolysis of aniline, Stemart and Schulz have been impelled to the conclusion (as the result of researches described in a first instalment in the March issue of "Chimie et Industrie") that it must originate in some other, as yet unrecognised, substance. It was not detected after pyrolysis of benzene-ammonia, phenol-ammonia or phenol-hydrocyanic acid at temperatures ranging from 600° to 900° C. Pyrolysis of aniline itself in a porcelain tube only gave yields of carbazole ranging from 7 per cent. at 775° C. to 1.5 per cent. at 950° C.

* * *

DETAILS OF ALCOHOL MANUFACTURE in Hungary by fermentation of the inulin-containing plant, topinambur, are published by Dr. R. Vadas in the "Chemiker-Zeitung," of March 24. This plant yields a rich harvest on indifferent soil and is therefore cultivated in Hungary for fodder on soil unsuitable for other crops. It bears nodules with an average composition, immediately after raising, of water 78 per cent., protein 2.33 per cent., fat 0.24 per cent., fibre 1.48 per cent., ash 1.05 per cent., and nitrogen-free extractive substances 16.9 per cent. Only the latter are important for alcohol manufacture. The first stage is disruption of the nodule cells either by steaming or in a shredding machine. The latter is preferable in that the enzyme, inulase, maintains its activity unimpaired. On keeping the disrupted nodules for 2 hours at 56° to 60° C. the inulin is converted into fermentable fructose, after which the mash is cooled to 25° C., mixed with brewer's yeast and kept at 20° C. to ferment for a period of 60 to 72 hours. From 8 to 8.5 litres of absolute alcohol are derived from 100 kg. of topinambur.

* * *

A DESCRIPTION OF THE RUSSIAN IODINE INDUSTRY is published in the "Chemische Industrie" (based upon information originally appearing in the "Moscow Journal of Chemical Industry"). It appears that the waters of the petroleum fields represent a cheaper source than marine plants. Three processes are in operation based respectively on absorption of the liberated iodine by active carbon (the most important), starch and petroleum. By the carbon method, the iodine-containing waters are acidified with sulphuric acid, iodine is liberated by subsequent treatment with sodium nitrite or chlorine and thereupon absorbed by active carbon. When the latter is saturated, treatment with hot lye or sulphite converts the iodine into sodium iodide. Three large and two small plants in different parts of the Union are manufacturing iodine by the active carbon process which generally yields iodine in a high degree of purity and compares very favourably with the low grade product of other processes.

SINCE 1930 Germany has been able to effect a decided improvement in its foreign trade in mercurial compounds, through a marked contraction of imports to virtually negligible proportions and a notable expansion in exports. The divergent trends in Germany's foreign trade in favour of the German producers became greaty accentuated in 1933, and whereas in 1931 imports exceeded exports by 32 metric tons in volume and 241,000 marks in value, in the first 10 months of 1932 exports exceeded imports by 52 tons, representing an export surplus of 150,000 marks

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, tar products, perfumery chemicals, essential oils and intermediates. Some slight improvement has been shown during the week in pharmaceutical chemicals and essential oils, but business in other markets has not been as active as of late. In the industrial chemicals market the best demand has been for acetone, formaldehyde and oxalic acid, while a fair amount of interest has been shown in anhydrous ammonia, caustic soda, acetic and formic acids. Quoted prices have been well maintained. Business in coal tar products has not been nearly so satisfactory as during the past few weeks. There has been a tendency towards lower prices in refined coal tar with keen competition for business. The export trade for pitch has been practically at a standstill, and there has been only a limited demand for naphthalene and most of the light products. A good demand is reported for creosote oil. In the pharmaceutical chemicals market the most active active items have been bromides, calcium lactate, hexamine, pyrogallic acid, sodium benzoate and vanillin. The aspirin market is reported to be unsteady and little interest has been shown in barbitone, paraldehyde, or salol. A number of items in the essential oils market have been in better demand.

LONDON.—There has been a fair average demand for the general range of chemical products and the market continues firm. There are no alterations in prices to report since our last issue.

GLASGOW.—The Scottish heavy chemical market continues to show signs of improvement.

General Chemicals

ACETONE.—LONDON : £65 to £68 per ton; SCOTLAND : £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80% £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON : Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND : Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER : 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND : Granulated commercial, £15 10s. per ton; powder, £28 10s. in 1-cwt. bags d/d free Great Britain in 1-ton lots upwards.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K

ACID, CITRIC.—LONDON : 9½d. per lb.; less 5%. MANCHESTER : 9¼d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 8d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON : £47 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND : Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE : Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND : 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON : £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND : 98/100%, £48 to £50 ex store. MANCHESTER : £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND : 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—LONDON : 11½d. per lb. SCOTLAND : B.P. crystals, 11d., carriage paid. MANCHESTER : 1s. 0¼d. to 1s. 0½d.

ALUM.—SCOTLAND : Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON : £7 10s. to £8 per ton. SCOTLAND : £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND : 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND : 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND : Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON : Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND : British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND : Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON : £16 10s. c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND : White powdered, £23 ex wharf. MANCHESTER : White powdered Cornish, £20 at mines.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BARYTES.—£7 to £8 10s. per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot 35/37% £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND : £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £15 10s. per ton; powder, £17 packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—2s. 7d. to 2s. 11d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3⅞d. to 5d. per lb. LONDON : 4½d. to 5d.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K. Green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb. Liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND : £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON : £3 19s. per cwt.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON : £27 per ton. SCOTLAND : 40%, £28 ex store.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON : White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND : White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER : White, £34 to £36; brown, £31 10s.

LEAD NITRATE.—£28 per ton. MANCHESTER : £27 10s.

LEAD, RED.—SCOTLAND : £25 10s. to £28 per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND : £39 per ton, carriage paid. LONDON : £37 10s.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND : Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND : Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8½d. to 9d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON : £42. MANCHESTER : £38 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON : 5d. per lb. with usual discounts for contracts. SCOTLAND : 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER : 5d.

POTASSIUM CHLORATE.—LONDON : £37 to £40 per ton. SCOTLAND : 99¾/100%, powder, £37. MANCHESTER : £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND : Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON : 9¼d. per lb. SCOTLAND : B.P. crystals, 9d. MANCHESTER : Commercial, 8½d. to 8¾d., according to quantity inh 2-cwt. drums; B.P., 9d. to 9¾d.

POTASSIUM PRUSSIATE.—LONDON : 8½d. to 8¾d. per lb. SCOTLAND : Yellow spot material, 8½d. ex store. MANCHESTER : Yellow, 8½d.

RUPRON (MINERAL RUBBER).—£16 10s. per ton.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND : Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER : £13 5s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £23.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. net.
SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.
SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£12 10s. per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.
SODIUM SILICATE.—140° Tw. Spot £8 per ton d/d station, returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground Spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £15 5s. per ton f.o.b.
SULPHUR.—£10 15s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.
ZINC SULPHIDE.—11d. to 1s. per lb.

Pharmaceutical and Fine Chemicals

The following price change is announced:—
ACID, SALICYLIC.—Technical, 1s. to 1s. 1d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8¾d. to 9d. per lb.; crude, 60's, 2s. 11d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 9d. per lb.; crude, 2s. 3d. to 2s. 4d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale, 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
ANTHRACENE OIL.—Strained, 4½d. per gal.
BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 4d. to 1s. 4½d.; 90%, 1s. 4½d. to 1s. 5½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLANDH Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 3½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3d. to 3¼d. f.o.r North; 4d. to 4½d. London. MANCHESTER: 3¼d. to 4¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 8d. to 1s. 9d.; 99/190%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £9 15s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PYRIDINE.—90/140, 5s. 9d. to 6s. 6d. per gal.
TOLUOL.—90%, 2s. 5d. per gal.; pure, 2s. 8d.
XYLOL.—*Commercial*, 2s. 7d. per gal.; pure, 2s. 7d. to 2s. 10d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.
p-CRESOL 34·5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 8¼d. per lb.; 66/68° C. 9½d.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags; £79 5s. in casks, in 1-ton lots.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
o-NITRANILINE.—5s. 10d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.
p-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £10. Grey, £16 to £17. Liquor, brown, 30° Tw., 7d. to 9d. per gal. MANCHESTER: Brown, £12 10s.; grey, £17.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.
CHARCOAL.—£6 10s. to £10 per ton.
WOOD CREOSOTE.—Unrefined, 6d. to 9d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 9d. to 3s. 3d. per gal. Solvent, 3s. 9d. to 4s. 9d. per gal.
WOOD TAR.—£2 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Home—£7 5s. 0d. per ton delivered in 6-ton lots to farmer's nearest station. Export—Nominal £5 17s. 6d. per ton f.o.b. U.K. ports in single bags.
CYANAMIDE.—£7 5s. 0d. per ton carriage paid to any railway station in Great Britain in lots of 4 tons and over.
BRITISH NITRATE OF SODA.—£7 18s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.
CHILEAN NITRATE OF SODA.—£7 18s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.
NITRO-CHALK.—£7 5s. 0d. per ton delivered in 6-ton lots to farmer's nearest station.
CONCENTRATED COMPLETE FERTILIZERS.—The prices for delivery up to June next in 6-ton lots to farmer's nearest station range from £10 15s. 0d. to £11 6s. 0d. per ton according to percentage of constituents.
NITROGEN PHOSPHATE FERTILISERS.—The prices for delivery up to June next in 6-ton lots to farmer's nearest station range from £10 5s. 0d. to £13 15s. 0d. per ton according to percentage of constituents.

Latest Oil Prices

LONDON, March 27.—LINSEED OIL was very quiet. Spot, £19 10s. (small quantities, 30s. extra), April, £17 17s. 6d.; May-Aug., £18 10s.; Sept.-Dec., £19, naked. RAPE OIL was inactive. Crude extracted, £24 10s.; technical refined, £26; naked, ex wharf. COTTON OIL was dull. Egyptian crude, £12 10s.; refined common edible, £15 15s., and deodorised, £17 5s., naked, ex mill (small lots, 30s. extra). TURPENTINE was steady. American, spot, 51s. per cwt.
HULL.—LINSEED OIL, spot, quoted £18 12s. 6d. per ton; March, £18 2s. 6d.; April, £18 7s. 6d.; May-Aug., £18 10s.; Sept.-Dec., £19, naked. COTTON OIL, Egyptian, crude, spot, £12 10s.; edible, refined, spot, £14 10s.; technical, spot, £14 10s.; deodorised, £16 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £14 5s. naked. GROUNDNUT OIL, extracted, spot, £18; deodorised, £22. RAPE OIL, extracted, spot, £23 10s.; refined, £25. SOYA OIL, extracted, spot, £15 10s.; deodorised, £18 10s. per ton. COD OIL, 22s. 6d. per cwt. CASTOR OIL, pharmaceutical, 35s.; first, 30s.; second, 27s. per cwt. TURPENTINE, American, spot, 53s. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

COATING OF ALUMINIUM or aluminium alloys.—Aluminium Colors, Inc. May 27, 1932. 407,208.

POTASSIUM OXALATE, production.—R. Koepp and Co. Chemische Fabrik Akt.-Ges. June 20, 1932. 407,225.

HYDROCARBONS OF LOW BOILING POINT by the destructive hydrogenation of solid carbonaceous materials, production.—International Hydrogenation Patents Co., Ltd. Nov. 12, 1932. 407,227.

HYDROCARBONS by the treatment of distillable carbonaceous materials with hydrogenating gases at elevated temperatures, production.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). July 7, 1932. 407,034.

IMMUNISATION OF SEED GRAIN and the like.—E. I. du Pont de Nemours and Co. May 26, 1931. 406,996.

CYCLIC ETHERS, manufacture.—H. Dreyfus. Sept. 1, 1932. 407,035.

Applications for Patents

MECHANICALLY PRODUCING coarse crystalline deposits.—Akt.-Ges. der Chemischen Produkten-Fabriken Pommerensdorf-Milch. March 9. 7530.

ESTERS FROM ACETYLENE, manufacture.—C. F. Boehringer and Soehne. March 14. (Germany, Feb. 28.) 8089.

VAT DYESTUFF PREPARATIONS in powder form, manufacture.—A. Carpmael and I. G. Farbenindustrie. March 13. 7952.

SULPHATES, preparation.—T. W. F. Clark. March 9. 7572.

PRINTING PASTES for textile materials, manufacture.—E. I. du Pont de Nemours and Co. March 8. (United States, March 8, '33.) 7448.

CASE HARDENING of iron and steel.—E. I. du Pont de Nemours and Co. March 12. (United States, March 10, '33.) 7841.

ETHER CONDENSATION PRODUCTS, manufacture.—E. I. du Pont de Nemours and Co. March 14. (United States, March 14, '33.) 8054.

PARASITICIDAL COMPOSITIONS and preparations.—Grasselli Chemical Co. March 14. (United States, March 14, '33.) 8055.

DISINTEGRATORS for fluid-borne solids.—Hathorn, Davey and Co., Ltd., and H. R. Lupton. March 9. 7484.

QUINOLINE CARBOXYLIC ACIDS.—I. G. Farbenindustrie and J. Y. Johnson. March 10, 7662.

VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. March 10. 7663.

DYEING and printing fibrous materials.—I. G. Farbenindustrie and J. Y. Johnson. March 12. 7775.

DYEING ANIMAL FIBRES.—I. G. Farbenindustrie and J. Y. Johnson. March 12. 7776.

APPARATUS for splitting hydrocarbons.—I. G. Farbenindustrie and J. Y. Johnson. March 14, 8057.

VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie. March 9. (Germany, March 9, '33.) 7603.

VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie. March 9. (Germany, June 3, '33.) 7604.

SULPHONIC ACID and carboxylic acid derivatives of 1:1[1]-diaryl-3:3[1]-arylene-5:5-bis-pyrazolones.—I. G. Farbenindustrie. March 12. (Germany, March 11, '33.) 7824.

ORGANIC DISULPHIDES, manufacture.—I. G. Farbenindustrie. March 14. (Germany, March 21, '33.) 8098.

PIGMENT PREPARATIONS, manufacture and application.—Imperial Chemical Industries, Ltd., M. Jones, W. F. Smith and A. Stewart. March 8. 7444.

DYESTUFF INTERMEDIATES.—Imperial Chemical Industries, Ltd., and W. A. Sexton. March 8. 7445.

AZO DYES, manufacture and application of.—Imperial Chemical Industries, Ltd., and K. H. Saunders. March 8. 7446.

DYEING.—Imperial Chemical Industries, Ltd., W. A. Sexton and H. Blackshaw. March 8. 7447.

WET PURIFICATION OF GASES.—Imperial Chemical Industries, Ltd. March 10. 7685.

WETTING, cleansing and emulsifying agents.—Imperial Chemical Industries, Ltd., H. A. Piggott and A. W. Baldwin. March 12. 7769.

ACID DYESTUFFS.—Imperial Chemical Industries, Ltd., F. Lodge, C. H. Lumsden. March 14. 8102.

MONOCALCIUM PHOSPHATE, production of.—Kali-Forschungs-Anstalt Ges. March 8. (Germany, March 31, '33.) 7400.

POTASSIUM NITRATE from sodium nitrate, production.—Kali-Forschungs-Anstalt Ges. March 8. (Germany, March 31, '33.) 7401.

HYDROGENATION of cresols, etc.—E. B. Maxted, Yorkshire Tar Distillers, Ltd. March 13. 7876.

PRODUCING SUBSTITUTED PHENOLS.—Rohm and Haas Co. March 14. (United States, March 28, '33.) 8040

TRANSMUTATION of chemical elements.—L. Szilard. March 12. 7840.

From Week to Week

THE DEGREE OF DOCTOR OF SCIENCE (Chemistry) has been conferred upon Mr. H. E. Cox, by the University of London.

MRS. ISABEL MARY MARTINDALE, widow of Dr. W. Harrison Martindale, Ph.D., Ph.Ch., F.C.S., late of 12 New Cavendish Street, London, died on March 23.

W. K. THOMAS AND CO., of Clock House, Arundel Street, Strand, W.C.2, have removed to 10 John Street, Adelphi, W.C.2. Telephone (unchanged), Temple Bar 3731. Telegrams: "Plysack, Rand, London."

THE NOMINAL CAPITAL of Economic Water Softeners, Ltd., 7 Mill Lane, Solihull, Warwickshire, has been increased by the addition of £5,000 in £1 ordinary shares, beyond the registered capital of £2,000.

MR. EMILE MOND has been appointed chairman of the Power-Gas Corporation, Ltd., in place of Mr. E. Lloyd Pease, deceased, and Sir Christopher Clayton, M.P., has been elected vice-chairman in place of Mr. Mond. For the same reason Mr. Emile Mond has been appointed chairman of Ashmore, Benson, Pease and Co., Ltd., and in this case Mr. Wilfred Beswick (managing director) has been elected vice-chairman in place of Mr. Mond.

IN CONNECTION WITH THE ACHEMA EXHIBITION of Chemical Engineering, which will be held in Cologne, May 18-27, a reduction in fares has been secured in Germany and in other countries for visitors travelling in parties. In most cases, the scientific and technical societies concerned have already undertaken to support the organisation of these group visits. Further details can be obtained from the Achema office, Achema-Geschäftsstelle, Seelze bei Hannover.

THE PHYSICAL SOCIETY have elected Lord Rayleigh as president and Dr. D. Owen as vice-president.

MR. JAMES BENNETT AITKEN, of Southlands, Penketh, Lancs., retired chemical manufacturer, who died on January 6 last, aged 88 years, left estate of the gross value of £30,944 (net personalty £29,089).

MR. IAN FRANK BOWATER has been elected to the board of directors of W. V. Bowater and Sons, Ltd., and Mr. Kenneth Noel Linforth has been appointed a director of Bowater's Mersey Paper Mills, Ltd.

THE ASSOCIATION OF TAR DISTILLERS will hold their annual dinner at the Cafe Royal, on Tuesday, April 24, at 7 for 7.30 p.m. This dinner is always of an informal nature and the speeches are generally few and more or less impromptu.

PROFESSOR WILLIAM EDWARD GIBBS (44), of Fairdene Road, Coulsdon, Surrey, Professor of Chemical Engineering at University College, London, and at one time chief chemist of the Salt Union, Ltd., left £11,401 (net personalty £7,304).

AN EXPLOSION IN THE FRENCH OIL TANKER "Giraffe" nearly blew the vessel out of the Seine at Port Jerome, near Rouen, on March 22. According to Lloyd's agents, 13 men were killed by the explosion and 10 others were injured. A pipe line used for transporting the oil from the refinery to the tanker caught fire and was immediately followed by explosions. In a few seconds the tanker was blazing fiercely, and the fire lasted for several hours. The heat was so intense that any attempt at rescuing the members of the crew on board was impossible. The "Giraffe" (1,171 tons) was owned by the Raffinerieries de Petrole de la Gironde.

SIR HAROLD HARTLEY, vice-president of the London, Midland and Scottish Railway, has been appointed chairman of the new company which has been registered under the title of Railway Air Services, "to establish and operate air transport services in the United Kingdom and elsewhere." It has been formed by the four railway companies and Imperial Airways. Surveys of the possibilities offered by various routes linking up the railway services by air are being made, and a definite statement of their proposals may shortly be expected.

AN INFLUENTIAL COMMITTEE, representing the wide interests, both academic and industrial, of the late Professor Thomas Gray, Director of the School of Chemistry, and "Young" Professor of Technical Chemistry in the Royal Technical College, Glasgow, has been considering the erection of a suitable memorial in the College. This is to take the form of a tablet with head in relief, and, if sufficient funds were available, an annual prize is to be instituted in some branch of technical chemistry. An appeal has been issued and Dr. G. S. Cruickshanks, Royal Technical College, Glasgow, will receive all subscriptions.

SIR GEORGE PATON, chairman and managing director of the British Match Corporation and Bryant and May, Ltd., died on board the P. and O. liner "Maloja," on March 23. He was 74. Sir George and Lady Paton were returning from a holiday in the South of France, and his death took place just as the liner was in the Thames estuary. So far as was known, Sir George had been in good health while on holiday. In addition to his connections with British Match and Bryant and May, Sir George was chairman of the Albright and Wilson Match Phosphorus Co., Bryant and May (Brazil), Chambon, J. and G. Cox and Jahncke. During the war he was chairman of the Administrative Committee of the Match Control Board.

THE BRITISH TRADE MISSION to Poland returned to London on March 16. The general impression is that a great deal of ground has been covered, and that the discussions will accelerate the conclusion of a trade agreement with Poland to the benefit of British exports. The chemical industry and the Association of British Chemical Manufacturers were represented by Mr. L. A. Munro and Mr. J. W. Kerr. In an interview, Mr. Mullins, Commissioner of the Overseas Trade Development Council, stated that the chemical industry of the two countries had definitely reached some understanding, and it is gratifying to know that Mr. Munro and Mr. Kerr were given every facility for meeting representatives of all the principal consuming industries, and for obtaining the maximum amount of information in the short time available.

THE IRISH FREE STATE PUBLIC SERVICES ESTIMATES for 1934-35 show that a sum of £94,000 is to be provided by the Government for the erection of distilleries for the production of industrial alcohol. A further £2,400 is being voted for the benefit of the new Industrial Research Council, the members of which have not yet been appointed; the cost of the State Laboratory during the year is estimated at £6,274 which is £594 lower than in 1933-34.

ADDRESSING A CONSERVATIVE MEETING at Middlewich on March 14, Lord C. Crichton-Stuart, M.P. for Northwich, said that the salt trade's application to the Import Advisory Committee for a tariff on imported salt had not been granted mainly because there had been opposition from the fishing industry. The salt trade could produce 3,000,000 tons annually, but was producing and selling 800,000 tons. The application, which greatly affected Winsford, Middlewich, and Northwich, would be renewed when possible.

A PRESENTATION TO THE RETIRING HON. SECRETARY of the Manchester Section of the Oil and Colour Chemists' Association will be made after the annual general meeting on Friday, April 13, when a hot-pot supper and entertainment have been arranged at the Manchester Limited Restaurant, at 8 p.m. Tickets, 2s. 6d. each are available from members of the Committee, or direct from Mr. H. Gosling, A.M.C.T., 22 Beaufort Road, Stockport. Dr. A. W. Baldwin has very kindly consented to be present as a guest, and will entertain members and their friends.

A NEW PITCHBLENDE FIELD has been discovered in the Great Bear Lake district of the North-West Territories of Canada. The new field is situated on the shores of the Beaver Lodge and Hottah Lakes, two small lakes about a hundred miles south of the Great Bear, and aeroplanes are carrying prospectors there. Over two hundred claims have been staked. A piece of pitchblende that has reached Cameron Bay on the Great Bear Lake is said to be as rich in radium as the Great Bear deposits. This extension of the pitchblende fields suggests that Canada may become the foremost radium-producing country in the world.

THE TWENTY-SECOND ANNUAL DINNER of the Finsbury Technical College Old Students' Association was held at the Trocadero on March 17, when ninety-four members and friends were present, including Mr. and Mrs. Mordey, Dr. and Mrs. Eccles, Professor Catterson Smith, Mr. C. R. Darling, Dr. Armstrong, F.R.S., Mr. and Mrs. R. W. Paul, Mr. E. Kilburn Scott, Mr. and Mrs. Esson, and Professor G. T. Morgan. Messages of regret were read from Professor Miles Walker, Mr. W. J. Tennant, Mr. E. W. Hill and Mr. E. T. Norris, who were unable to be present through illness. Mr. Norris was chemical lecture assistant at the College for 47 years.

Books Received

Converting a Business into a Private Company. By Herbert W. Jordan. London: Jordan & Sons, Ltd. Pp. 50. 1s. 6d.

Technical Gas Analysis. By George Lunge. Revised and re-written by H. R. Ambler. London: Gurney and Jackson. Pp. 410. 21s.

An Index to Acts of Parliament and Statutory Rules and Orders Affecting the Chemical Industry. London: The Association of British Chemical Manufactnrers. Cambridge: W. Heffer & Sons, Ltd. Pp. 6. 6d.

A Manual of Foundry Practice. By J. Laing and R. T. Rolfe. London: Chapman & Hall, Ltd. Pp. 276. 15s.

The Design and Construction of High Pressure Chemical Plant. By Harold Tongue. London: Chapman & Hal., Ltd. Pp. 420. 30s.

Suppression of Weeds by Fertilisers and Chemicals. By H. C. Long, Surbiton, Surrey. Pp. 57. 2s.

Official Publications Received

Economic Conditions in Switzerland. By Dr. H. C. A. Carpenter. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 63. 2s.

The Action of Water on Lead with Special Reference to the Supply of Drinking Water. Water Pollution Research, Technical Paper No. 4. Department of Scientific and Industrial Research. London: H.M. Stationery Office. Pp. 115. 2s.

New Companies Registered

Ruby Water Softeners, Ltd., 5 John Street, Bedford Row, London, W.C.1. Nominal capitael £100. To acquire the business of manufacturers of water softeners carried on by J. W. Still and J. Geach, as "Still and Geach," at North End Lane, Downe, Kent. Directors: J. W. Still, J. Geach.

New Chemical Trade Marks

Opposition to the registration of the following trade marks can be lodged up to April 7, 1934.

Cirrasol. 543,664. Class 1. Chemical substances for use as softening agents for the treatment of textile materials in the course of manufacture. British Dyestuffs Corporation, Ltd. August 9, 1933.

Mavadol. 546,875. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. H. Th. Böhme Aktiengesellschaft, 20 Moritzstrasse, Chemnitz, Saxony, Germany. December 7, 1933.

Maxoclor. 548,006. Class 2. Chemical substances used for agricultural, horticultural, veterinary and sanitary purposes. Imperial Chemical Industries, Ltd. January 23, 1934.

Sofnol. 547,253. Class 2. Chemical substances used for agricultural, horticultural, veterinary and sanitary purposes, but not including soap. Sofnol, Ltd., 62 Westcombe Hill, Greenwich, London, S.E.10. December 22, 1933.

Forthcoming Events

Apr. 4.—Society of Public Analysts. "The Determination of Small Quantities of Fluorides in Water." Guy Barr and A. L. Thorogood. "A Test for Ethylene Glycol and its Application in the Presence of Glycerol." A. W. Middleton. "The Detection of Diamines in Leather." W. Mather and W. J. Shanks. 8 p.m. Burlington House, Piccadilly, London.

Apr. 6.—Society of Chemical Industry (Chemical Engineering Group, Yorkshire Section, Food Group). Conference on Air Conditioning and an Exhibition of Apparatus. 3 p.m. Queen's Hotel, Leeds.

Apr. 6.—Society of Chemical Industry (Manchester Section). Annual general meeting of the Section. 7 p.m. 17 Albert Square, Manchester.

Apr. 6.—Society of Dyers and Colourists (Scottish Section). Annual general meeting. 7 p.m. George Hotel, Buchanan Street, Glasgow.

Company News

Hadfields, Ltd.—The directors report that the profit for 1933 amounted to £90,857, an increase of £73,574 over that of 1932.

Burt, Boulton and Haywood, Ltd.—For the year ended June 30, 1934, a dividend of 2 per cent., less tax at 4s. 4½d., is announced, payable on April 9, on the ordinary shares.

Tomaszow Artificial Silk Works.—The directors have decided to propose, at the general meeting, to be held shortly, the payment of a dividend of 4 per cent. for the year 1933. For 1932 no dividend was paid.

Asbestos Corporation.—The operating profit in 1933 amounted to $73,500, compared with a loss of $428,500 in 1932. The year's net deficit, after allowing for depreciation and other charges, amounted to $295,250 compared with a net deficit of $711,250 for 1932.

John Knight, Ltd.—The report for 1933 shows a profit, including company's proportion of profits of its subsidiaries, of £183,386, plus transfer from contingencies reserve, £50,000, transfer fees £49, and balance from previous year £124,448, making £357,883. After payment of dividends £105,000 is carried forward.

Canning Town Glass Works.—The net trading profit for the year 1933 was £28,555, against £23,059 for 1932. With £10,495 brought in, there is £39,050 available. The dividend is raised from 4 to 5 per cent., absorbing £17,937, and the sum of £10,113 is carried forward.

Morgan Crucible Co.—The net trading balance for 1933 is reported to be £245,832, compared with £214,159 for 1932. Including £22,689 for interest and rents and balance brought in, £917, there is available £269,438. The directors propose that £80,925 be used in capitalisation of 5 per cent. obligations to be retained for employment in business, compared with £53,950. The final dividend on deferred ordinary shares is 10d. per share, less tax, against 6d. This absorbs £67,437, leaving £551 to be carried forward.

Tarmac, Ltd.—After providing general establishment charges and tax, the net profit for the year 1933 was £77,651, to which is added the Balance brought forward £29,225, making £106,876. The directors recommend a dividend on the ordinary shares of 5 per cent., transfer to general reserve £5,000, to staff fund £1,000, leaving to be carried forward £29,266.

United Drug Co. Inc.—The report, including subsidiary companies, for 1933 shows a net profit of $647,789, equivalent to 46 cents a share on the 1,400,560 shares issued or to be issued in exchange for undeposited shares of Drug, Inc. This profit is after credit of $868,086 discount on debenture bonds of United Drug Co. acquired and after debit of $560,394 loss from operation of leases acquired by United Drug Co. as guarantor from Louis K. Liggett Co.

United Glass Bottle Manufacturers, Ltd.—The report for 1933 shows trading profit at £211,901, against £202,281 in 1932. The allocation to debenture redemption reserve is increased from £10,970 to £11,650, while the staff fund receives £6,500, compared with £6,000. The ordinary dividend is repeated at 7½ per cent. and the carry-forward raised from £42,618 to £43,134. The annual meeting will be held on March 22, at 12.15 p.m., at Winchester House, Broad Street, London.

English China Clays.—The accounts for 1933 states that consideration to be received for transfer of assets to new company, English Clays Lovering Pochin and Co., has now been determined and satisfied by issue of fully paid shares in English Clays Lovering Pochin and Co., as follows:—1,392,956 ordinary shares of £1 each issued at 22s., 150,786 7 per cent. redeemable cumulative preference shares of £1. The difference between book figures of assets transferred and value of shares at prices of issue is £85,736. The company's total holding of shares in English Clays represents 62.98 per cent. of ordinary capital and 60.21 per cent. of preference capital, consequently the new company is subsidiary within the meaning of Companies Act, 1929. The actual value of shares of English Clays must depend mainly on profits earned and dividends paid in future, and cannot yet be measured.

ADVERTISERS please note that the latest hour at which we can accept advertisements for insertion in these columns each week is 10 o'clock on Thursday morning.

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BOYS of good character, well-trained and eager to work, will be gladly recommended by the Warden of the John Benn Hostel, Bower Street, E.1.

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